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Municipal Energy Conservation in Alberta

Alberta
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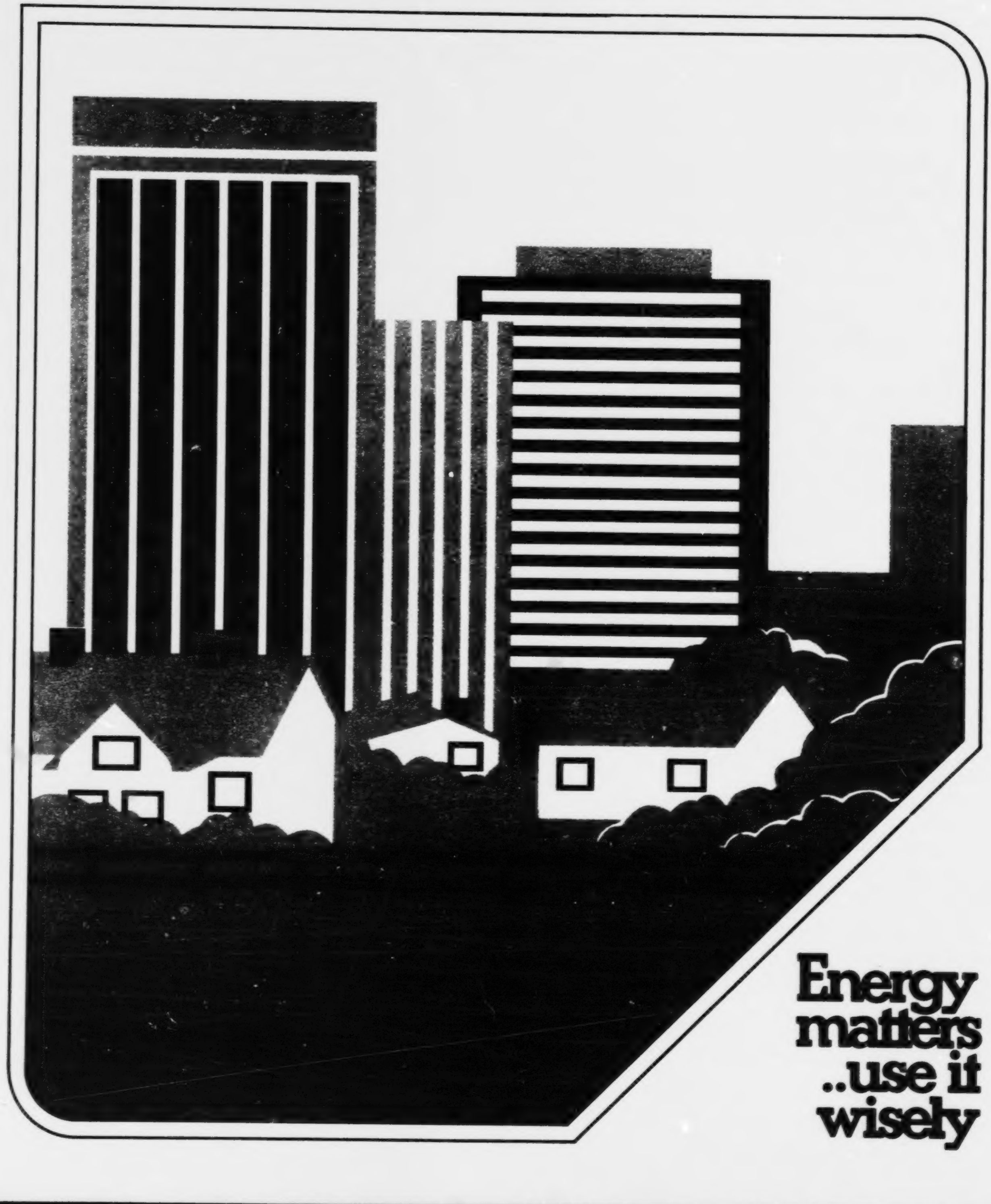
Energy Conservation Branch



Energy matters ..use it wisely

MUNICIPAL ENERGY CONSERVATION IN ALBERTA

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1983
Edmonton

Alberta
ENERGY AND
NATURAL RESOURCES
Energy Conservation Branch

ENR Number T/29 Rev. 83
ISBN 0-86499-103-7

Additional copies of this report may be obtained from:

Energy Conservation Branch
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Edmonton, Alberta, Canada
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First edition of this report published May 1982.
Revised and expanded edition published June 1983.

EXECUTIVE SUMMARY

The main purpose of this study was to determine the extent to which municipal officials in Alberta were interested in energy conservation programs and what programs had been implemented by them. Barriers to the implementation of such programs were to be identified and a report made on the activities in other provinces with regard to municipal energy conservation. On the basis of this information recommendations were to be made for a possible provincial program to assist municipalities with energy conservation measures.

A second portion of this study, completed subsequent to the main report, involved monitoring the progress of an internal energy conservation program established by the City of Red Deer. Based on the first year of program operations, recommendations were prepared to assist other municipalities undertaking similar energy management efforts.

To obtain information for this study questionnaires were sent to all Alberta municipalities and the Regional Planning Commissions. Interviews were held with the larger urban municipalities, with regional planning commissions, utility companies and other relevant agencies or organizations.

The response rate to the questionnaires was 30% over-all, but with a greater response (50%-63%) from the larger urban centres (over 3,000 population). The larger urban centres also indicated more interest in energy conservation and 28% of this group indicated that they had taken some steps or had considered taking some steps to conserve energy. To these municipalities the first step in energy conservation was usually to consider ways of reducing energy use in the arenas or recreation complexes.

In order to monitor a program of energy conservation a municipality needs to keep records of how much energy and what kind of energy is used for each facility or building. Only the City of Edmonton had complete records in energy units. Calgary, Lethbridge and Cardson had some records in energy units. About half of the replies to the questionnaires indicated that records could document in dollar terms the cost of energy used for each building and facility by type of energy (electricity, natural gas and liquid fuels).

While some municipalities are aware of the opportunity to save energy in terms of their own operations, few of them appeared to be aware of the opportunities for reducing energy use by improved urban design. Increased use of public transportation, car-pooling and cycle paths were frequently mentioned as methods of conserving energy but not improved subdivision design, orientation of houses on the lot, landscaping, lot width or street width. The Regional Planning Commissions mentioned improved sub-division design but felt that there was a lack of leadership from the province, a lack of understanding on the part of municipalities, and no pressure from the general public. Representatives of the Urban Development Institute and Housing and Urban Development Association of Canada agreed that the provision of improved energy-efficient sub-division design and housing depended on greater knowledge and interest on behalf of municipalities and the general public.

With the exception of the Energy Conservation Branch of Alberta Energy and Natural Resources, education of the public with regard to energy conservation has not been a high priority in Alberta. The utility companies have done a little, municipalities almost nothing.

The major barrier to a program of energy conservation by municipalities or by anyone in Alberta, is that energy is still perceived as being inexpensive. This view is encouraged through subsidies by the provincial and federal governments. To change a way of life developed on the premise of cheap energy requires a major change of attitude. While energy remains relatively inexpensive such a change is not likely to happen.

Other barriers cited in the questionnaires were lack of interest, lack of knowledge, lack of motivation, lack of technical expertise, lack of time. Legislative barriers in the Building Code, Land Use By-Laws, Planning Act, and Sub-division Regulations were of lesser importance.

Municipal programs in other provinces are in various stages of implementation. Nova Scotia, Ontario and British Columbia are the best organized.

A case study was undertaken of the City of Red Deer's energy conservation program. The program included assistance from Alberta Recreation and Parks and the Energy Conservation Branch of Alberta Energy and Natural Resources.

The Branch's Energy Bus personnel undertook a series of energy audits of nine municipal buildings in the summer of 1981 and made general and specific recommendations for energy savings. Action taken by the City of Red Deer included preparation of a manual for recreation building operators.

Results from the first year of the Red Deer program, which show few savings, indicate a need for any municipality to clarify its expectations and commitment to a program of energy conservation, and for building operators to be trained to monitor energy use accurately.

In the event that the Alberta government chooses to expand its present energy conservation services to municipalities, the following recommendations are indicated by the results of this study:

1. The variation in size of municipalities and the variation in the level of motivation, knowledge and interest make a blanket approach to a program to encourage municipal energy conservation very difficult. Any programs which are devised should take into consideration the diverse needs and interests of municipalities.

2. The use of the Energy Bus audit service for municipal buildings should be continued, and, when appropriate, expanded.

3. A municipal advisory component should be available in the Energy Conservation Branch of Alberta Energy and Natural Resources. This component would provide follow-up assistance after an audit by the Energy Bus and would also be able to provide information and advice on municipal operations other than buildings, such as transportation, street lighting, water and sewer services. The services of this component should be available on request from municipalities and not imposed upon them.

4. Information in the form of workshops should be made available to those municipalities which have indicated a need for general information. Workshops initially should be programmed to answer the point of view expressed by some municipal representatives: "We do not think there is any way in which we can save energy".

Programs could show what has happened in other towns, e.g. Grande Cache, and what can be done in each of the municipal service areas.

5. Demonstration projects should be undertaken to give practical instruction to municipalities which have the basic information but need help in implementing it. The intention of the demonstration projects would be to inform those attending what results could be achieved and to give them step-by-step instruction on how to do it.

   Some of the demonstration projects might include:
   Basic Maintenance: Weatherstripping, caulking, insulating, care and maintenance of furnaces, maintaining fleet vehicle efficiency, etc. These projects could be demonstrated by a town which has undertaken them successfully.
   More Advanced Technical Programs: These could include the use of heat exchangers, the use of waste heat from compressors to heat water, methods of improving the efficiency of heating systems, understanding the design of heating systems, etc.
   Management Programs: A successful program of energy management depends on the motivation of employees and the support given by senior management and City Council. The City of Edmonton has a very sophisticated management technique in this area and would probably be prepared to conduct a demonstration project.
   Record Keeping and Monitoring: If a municipality enters into an energy conservation program it is essential that they keep records in energy units. Otherwise they are unable to measure whether their program is a success or a failure, unable to measure which parts of the programs are successful and where and when the failures occur.
   Innovative Programs: Demonstration projects on the effectiveness of fleet conversion to alternative fuels, on how to install a vapour barrier, on alternative methods of solid waste disposal, on how to design the most energy efficient town, on the uses of biomass on the farm, or on the use of wind energy on the farm.

6. The implementation of the workshop and demonstration programs can be undertaken in a number of different ways:
   a) Hire a consulting firm to do it.
   b) Ask Community Planning Association of Alberta to hold seminars on energy in the same way in which they have held seminars on planning in 1981.
   c) Try to combine a consulting firm and CPAA.
   d) Ask the Alberta Urban Municipalities Association (AUMA) to organize seminars and workshops on energy conservation.
   e) Try to combine a consulting firm with AUMA.
   f) Ask Alberta Municipal Affairs and Provincial Planning Board to organize seminars, workshops and demonstration programs.

7. Regional Planning Commissions should be encouraged to consider energy management as part of their mandate. Alberta Municipal Affairs should be encouraged to start working with regional planning commissions to extend their influence in the design of energy-efficient urban form.

   Alberta Housing and Public Works should also be encouraged to review their commitment to, and influence on, the construction of energy-efficient housing.

8. A study should be undertaken to determine what energy conservation measures can be implemented in water and sewer services.

9. Further study should be undertaken to determine why there is such an apparent discrepancy in street lighting costs between Alberta and other provinces.

10. The utility companies should be used to the greatest extent possible in a program of workshops and demonstration projects.

11. Consideration should be given to establishing a training program through N.A.I.T., S.A.I.T., the community colleges and the universities to train people in energy conservation principles and techniques.

12. Some incentive funding should be available for "way-out" ideas which might just prove viable.

13. There is a need for careful monitoring of all programs and results:
    a) to evaluate which programs work, and why, and
    b) to pass on the information to other municipalities.

14. The Energy Conservation Branch of Alberta Energy and Natural Resources should undertake a vigorous public information program directed at the general public. Alternatively, where municipalities are willing to undertake such a program, the Energy Conservation Branch could assist by providing resource personnel.

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FOREWORD

March 1982

This study was commissioned by the Energy Conservation Branch of Alberta Energy and Natural Resources.

The Energy Conservation Branch has been aware of a growing level of interest from the public and from municipal authorities in the services offered by the Branch, particularly its Energy Bus audit service. The intent of this study was to survey all Alberta municipalities to evaluate their interest in energy management and identify their needs in this regard.

The study provides a wealth of useful information and will be most helpful to the Energy Conservation Branch in planning to deliver its programs more effectively and providing assistance where it is needed most. The study should also be of interest to municipalities, private consultants and members of the public who are involved in municipal energy management activities.

The opinions expressed in this report are those of the consultant and are not necessarily those of the Department.

Ian Burn
Director
Energy Conservation Branch

ACKNOWLEDGEMENTS

This project could not have been completed without the cooperation of the town managers, municipal administrators and secretary-treasurers of Alberta municipalities. They contributed their time to complete the questionnaires and they agreed to be interviewed about energy conservation programs in their community, often at very short notice. The cooperation of representatives of utility companies, representatives of various Alberta government departments and representatives of other non-government agencies is appreciated. Without such cooperation the information gathered would be incomplete.

Our thanks are also due to Mr. T. Zdan who analyzed the results of the questionnaires and to Marg Demeria and Gerri Brown who typed and re-typed draft after draft of the report.

In particular we would like to acknowledge the assistance given to us by Mr. Stephen Tyler of the Energy Conservation Branch of Alberta Energy and Natural Resources. His courtesy and his practical approach were very helpful to us in the completion of this project.

Anna Parkinson
Urban Consultants Ltd.

1. INTRODUCTION

This study was undertaken to show the extent to which municipal officials in Alberta are aware of and interested in potential energy conservation actions at the local level. Such actions could include reduced energy use in municipal operations, the promotion of energy-efficient urban planning and design or the encouragement of energy conservation by the general public. In addition specific energy conservation programs which have been implemented by Alberta municipalities were to be identified.

Barriers and resource deficiencies which have hampered or restricted the implementation of municipal energy conservation activities were also to be observed and documented and an account given of the nature and general results of municipal energy conservation activities and programs sponsored by other provincial governments.

An additional aspect of the study was to observe, monitor and report on the initiation and implementation of the internal conservation program being undertaken by the City of Red Deer. Only a report of the initial stages of this program is included here. A further report will be produced when the program has been more fully established.

Based on the above findings, recommendations were made as to whether a provincial program of advice and assistance in municipal energy conservation would be appropriate, and if so, what structure or delivery mechanism could be utilized.

The time frame for this study was extremely short, only fifteen weeks. This necessitated placing greater reliance on telephone interviews than would perhaps otherwise have been considered desirable.

In the organization of the report an analysis of existing municipal energy conservation programs follows an account of the methodology and the breakdown of questionnaire responses. The account of municipal energy conservation programs deals, first of all, with activities within the municipal organization. These include recreation facilities, municipal buildings, municipal vehicles, street lights, public transit and water and sewer systems. This is followed by a section on the necessity for, and the availability of, good record keeping. A third sub-section of municipal energy conservation programs deals with urban planning and design and the fourth with encouraging energy conservation by the general public.

Section 5 gives some information about the interest in innovative ideas for energy conservation in the Province and Section 6 outlines the role of other agencies which impinge on municipal energy conservation programs. The following section deals with the strengths on which a provincial program could be built as well as the barriers to energy conservation programs. The final two sections of the report deal with programs in other provinces and the recommendations.

2. METHODOLOGY

In undertaking this study the first step was to draft two questionnaires, one for municipalities and one for regional planning commissons (see Appendix I). These questionnaires were mailed to all municipalities and all regional planning commissions.

The next step was to interview personally the senior management of the largest towns and cities with populations over 3000. The directors and staff of regional planning commissions were also interviewed. Towns and cities over 3000 population were chosen partly because they are likely to have larger energy bills and therefore greater potential for, greater need for and, perhaps, greater interest in energy savings. Other interviews took place at the annual conference of the Association of Urban Municipalities of Alberta and some were conducted by telephone. When the opportunity arose, either when driving through a region or by meeting a representative at the AUMA Convention the views of some smaller centres were canvassed as well.

Of the eight Regional Planning Commissions, personal interviews were held with seven of the directors and members of their staff. Only the director of the Peace River Regional Planning Commission was interviewed by telephone.

Personal interviews and telephone conversations were held with representatives of utility companies in Alberta. These were Al Burnard of TransAlta Utilities Corporation, Mrs. M. Kaiser of the City of Calgary Electric Systems, Roy Nourse of Canadian Western Natural Gas, Moe Salm of Northwestern Utilities and Jerome Chephya of Alberta Power. Other telephone conversations were held with representatives of energy management programs in other provinces and information was also gathered from other Alberta government departments. A breakdown of activities is included in Table 1.

As a result of these interviews a number of reports were received. These were read and analysed and their relevance to the project evaluated. Other information gathered, such as opinions, attitudes towards energy conservation, attempts at programs and their results are embodied in the main part of this report. After all these materials were assembled and analysed, recommendations with regard to a future program were formulated.

Participation in the Red Deer Case Study proved relatively time consuming but very interesting. The activities of the Energy Bus personnel were observed. The meetings at which their results were presented to the Red Deer representatives were attended. Energy consumption in city facilities for the year prior to the Energy Bus audits was compared with consumption for the year following the audits by comparing utility records. The progress of the City's energy management program was also monitored through interviews with key officials. Results of the Red Deer Case Study are contained in Chapter 9.

TABLE 1

Schedule of Personal and Telephone Interviews

	Personal Interview	Telephone Interview
Urban Municipalities with population over 3000	31	20
Regional Planning Commissions	7	1
Representatives of Utility Companies	4	1
Energy Management Personnel in other Provinces	1	3
Representatives of other Government Departments in Alberta	3	2
	46	27

3. RESULTS OF QUESTIONNAIRES

The response to the questionnaire was approximately 30% over all the municipalities - See Table 2. For the larger urban municipalities, 3000-5000 and over 5000 population, the rate of return was 50% and 63%. Even for summer villages who use very little energy the response rate was 21%. There are many reasons why the response rate to the questionnaire was not greater. Undoubtedly, filling in a questionnaire is a chore and this one was quite long. Town Managers are busy people and some of the questionnaires probably went straight into the waste paper basket. To some extent the response rate indicates a lack of interest in the topic. Perhaps particularly disappointing is the low rate of response from urban areas with population between 1500 and 3000 (28%) and 1000 and 1500 (23%). However according to Table 3 almost half of the responses in the 1000-1500 population category indicated some consideration of energy conservation. Of the larger towns (over 3000) 50% of the responses indicated that some consideration had been given to energy conservation. This represents 28% of the municipalities in this category.

Table 4 indicates that, overall, in 72% of the responses no steps were taken toward energy conservation. Table 4 also indicates what steps were taken but it tends to underestimate the number of energy audits and energy conservation programs which actually exist. As will be seen from the main section of the report the interviews uncovered a number of municipalities, mostly the larger urban ones, with programs of some kind. Not all of them sent back questionnaires. Grande Cache, for example, is known to have very significantly reduced energy use in its recreation complex, and they are very proud of their achievement. They saved $16,000 in their energy bill in the first year of the program, but since they did not return the questionnaire their activities are not included in the tabulations. In this instance, and perhaps in others, the tabulated results of the questionnaires underestimate the interest and activity in energy conservation programs.

In response to question 6, which asked the municipalities to indicate what type of assistance they would prefer, the larger urban ones indicated their first preference was for financial aid while the smaller urban ones and the rural ones indicated their first choice was for general information.

The tabulation of the answers to all the questions in the questionnaire is included in Appendix I. Taken by themselves they tend to indicate a lack of interest in energy conservation but the results of the interviews document much more positive attitudes towards energy conservation and these are discussed in the following sections.

TABLE 2

Response Rate

Classification	No. Questionnaires Sent	No. Questionnaires Returned	% Returned
Over 5,000	27	17	63
3,000 - 4,999	26	13	50
1,500 - 2,999	25	7	28
1,000 - 1,499	30	7	23
500 - 999	35	13	37
0 - 499	98	21	21
Summer Villages	39	8	21
Counties	30	9	30
Municipal Districts	18	5	28
Improvement Districts & Special Areas	23	4	17
			Percent of Total Sent Out
TOTAL	351	104	30

TABLE 3

Interest in Energy Conservation
as reported by Questionnaire Response

Classification	No. of Responses	No Answers	% of Responses	Yes	% of Responses	No	% of Responses
Over 5,000	17	0	0	10	59	7	41
3,000 - 4,999	13	0	0	5	38	8	62
1,500 - 2,999	7	1	14	1	14	5	72
1,000 - 1,499	7	0	0	3	43	4	57
500 - 999	13	0	0	5	38	8	62
0 - 499	21	0	0	2	10	19	90
Summer Villages	8	1	13	0	0	7	87
Counties	9	0	0	4	44	5	56
Municipal Districts	5	0	0	1	20	4	80
Improvement District & Special Areas	4	0	0	0	0	4	100
TOTAL	104	2	2	31	30	71	68

TABLE 4

Status of Energy Conservation Programs
Reported by Questionnaire Responses

Classification	No. of Responses	Nothing No Answer No steps taken	%	Conduct Audits Studies	%	Form Admin. Committee Current Discussion	%	Use Energy Bus	%	Adopt Conservation Measures	%	School Program	%
Over 5,000	17	7	41	4	24	3	18	1	6	3	18		
3,000 - 4,999	13	8	62	2	15			1	8	2	15		
1,500 - 2,999	7	6	86							1	14		
1,000 - 1,499	7	5	71			1	14			2	29		
500 - 999	13	10	77	1	8					2	15		
0 - 499	21	20	95			1	5						
Summer Villages	8	8	100										
Counties	9	4	44							2	22	2	22
Municipal Districts	5	3	60							2	40		
Improvement Districts & Special Areas	4	4	100										
TOTAL	104	75	72	7	7	5	5	2	2	14	13	2	2

*May total more than 100% due to multiple answers

4. MUNICIPAL ENERGY CONSERVATION

Rapidly rising energy costs have made some municipal governments very aware of the advantages to be gained by a program of energy conservation. Good management practice has always monitored costs of operation but until recently energy costs have not been considered significant enough to warrant special study. For municipalities in Alberta this is still true but as energy costs rise it is projected that they will constitute an increasing percentage of the municipal budget. The efficient use of energy will become increasingly important to achieve dollar savings both for the city and the public. The City of Edmonton has currently the most sophisticated programs for energy conservation and its policy states that by starting to implement energy conservation programs now the City will be more economically viable in the future.

There are several ways in which a municipality can achieve or influence energy savings. In broad terms these are:

Savings in its own municipal operations. i.e. savings of electricity, natural gas and gasoline or diesel fuel in the operation of municipal services such as street lights, recreation facilities, municipal buildings and municipal vehicles.

Savings achieved by the citizens because of energy efficient urban land use. These savings can be achieved by mixed urban land use and greater density so that children can walk to school, employees can walk or cycle to work, housewives or families can walk to the store or to recreational facilities.

Savings can also be achieved by citizens if towns are designed so that houses are energy efficient and heating bills are reduced to the minimum. This can be achieved by good design of sub-divisions, by provision of east-west streets, by the orientation of houses on the lots, by landscaping, and ensuring access to sunlight.

Savings achieved by encouraging energy conservation by the general public. By providing information to the general public on the methods and the desirability of energy conservation, a municipality could help to promote savings in the use of energy. This would reduce the demand provincially for additional energy and also the proportion of the family budget spent on energy.

Based on research of Alberta municipalities each of these sections is reviewed below.

4.1 ENERGY CONSERVATION IN MUNICIPAL OPERATIONS

Several municipalities have initiated energy conservation measures in the operation of their own services. Ten municipalities have requested and received an energy audit from the Energy Bus, operated by Alberta Energy and Natural Resources (October 1981). A few others have received the same type of help from utility companies (e.g. TransAlta Utilties Corporation and Canadian Western Natural Gas in High River).

4.1.1 Recreation Facilities

Recreation facilities are often the first municipal services to receive attention when a program of energy conservation is undertaken. Several municipalities have sent municipal officials, usually recreation directors, to seminars dealing with energy conservation in recreation facilities. These seminars have been organized by Alberta Recreation and Parks and by the utility companies. The result of these measures has been a greater awareness of the savings which can be achieved by switching off lights when they are not required, by substituting much more energy-efficient lighting for that currently used, by increasing insulation in walls and ceilings, by turning down thermostats while buildings are empty, by increasing the number of switches so that not all the heaters in the spectator area (for example) have to be in operation at once. From audits that have already been undertaken in municipal buildings (e.g. Grande Cache and Red Deer) savings of 20%-50% in energy terms are quite attainable.

Indoor swimming pools and recreation centres have also been the subject of energy audits in some towns, though less frequently than arenas. Examples are Spruce Grove, Leduc and St. Albert. Unfortunately it is too early yet to monitor the resulting energy saving as a result of these audits. The town of Cardston which has an outdoor pool has invested in a thermal blanket which covers the surface of the water in their pool at night in order to lessen the heat loss. This blanket has only been in operation for one month so far (August 1981) but the town reports a reduction in energy use for heating the swimming pool from 1824 MCF in 1980 to 1256 MCF in 1981. This does not take into account any comparison of degree days, or the fact that the season was slightly longer in 1980 but the reduction is nevertheless quite significant.

Other recreation facilities which have been considered for energy conservation programs include the lights surrounding tennis courts, ball diamonds etc., and the heating of recreation shelters used in conjunction with outdoor rinks. It is obvious that the potential for saving energy in recreation buildings depends on the extent of the recreation program and the energy used.

While most of the recommendations on how to achieve greater energy efficiency are reasonably simple and easy to understand, others can be more technical in nature and pose problems for municipal staffs. Most town managers, town administrators, and secretary-treasurers have a background in management or in finance. Few of them have the expertise required to fully evaluate sophisticated technical measures. They can determine the capital cost of changing one type of light fixture to another and the length of time before pay-back is achieved. However, some more technical recommendations leave municipal administrators boggled. One of them, after being advised that energy savings could be achieved by altering the position of a cold air intake and improving the flow of heated air, exclaimed "How can I get an estimate of the capital cost of doing this, when I cannot explain to a local contractor what it is I want him to do?" The Energy Bus personnel and the utility companies do not follow up after their initial examination in order to monitor the results of their analysis or to provide assistance in its implementation. Neither, for obvious reasons, do they recommend specific consulting or contracting firms to carry out the work. Larger cities have on their staff people with technical qualifications who can interpret and implement recommendations concerning energy conservation but the large majority of municipalities in Alberta lack this type of expertise.

Rural municipalities do not as a rule have recreation facilities. Most villages and small towns have an arena, a curling rink and a community hall. The heating and lighting of the community hall is kept to a minimum except when the building is in use. The ice-making in the arena and curling rink is confined to October to April when the operation can expect some assistance from the cooler outside weather. Only occasionally, in Alberta, does one find an outdoor swimming pool in a town with a population under 3,000 though in towns over that size they are quite common. Outdoor pools, however, are also operated seasonally. They usually open for the season at the end of May and close at the beginning of September. In this way these smaller communities are already practising energy and dollar conservation measures. As far as recreation facilities are concerned, it is in the cities and larger towns, where complex and sophisticated recreation facilities are provided, that the greatest opportunity for energy savings occur. The town of Grande Cache, as already mentioned, has demonstrated a significant reduction in energy use. For the first year after instituting the program they saved $16,000 on their energy bill. Savings have continued, and now in spite of increased unit costs their energy bill for the winter 1980/81 was no higher than it had been five years previously. Other towns have expressed interest or have started a program but feel they need more help (see Tables 5 and 6). More will be said later about the type of programs undertaken and the help required.

4.1.2 Municipal Buildings

While most rural municipalities do not operate recreation facilities nearly all of them operate at least one building. The exceptions are summer villages and improvement districts. As one reply to the questionnaires stated: "This summer village operates no buildings and no vehicles. Obviously they are already saving all the energy they can."

Small municipalities may have only an office, or an office combined with a fire hall. Depending on its size the buildings owned and operated by a municipality apart from recreation facilities may include fire halls, police stations, libraries, senior citizen centres, public works buildings and transit garages. All of these buildings would be amenable to a program of energy conservation and 31 municipalities (see Table 3) indicated from questionnaires that they had a program or had attempted a program of some kind. Some of the administrators expressed disapppointment however with the cooperation they received in the implementation of this program. They claimed it was difficult to maintain motivation, a course of action which was accepted by department heads, foremen and employees would be implemented for a week or so and then forgotten. In one town protective covers had been riped off the thermostats so that they could be re-set manually.

TABLE 5

Request for Assistance with Program of Energy Conservation

Classification	Response	Yes	%	No	%	N/A	%	Unsure	%
Over 5,000	17	15	88	1	6	1	6	-	0
3,000 - 4,999	13	12	92	1	8	-	0	-	0
1,500 - 2,999	7	7	100	-	0	-	0	-	0
1,000 - 1,499	7	6	86	1	14	-	0	-	0
500 - 999	13	11	85	-	0	1	8	1	8
0 - 499	21	11	52	9	43	1	5	-	0
Summer Villages	8	2	25	5	63	1	13	-	0
Counties	9	5	56	1	11	1	11	2	22
Municipal Districts	5	4	80	-	0	-	0	1	20
Improvement Districts & Special Areas	4	3	75	-	0	-	0	1	0
TOTAL	104	76	73	18	17	5	5	5	5

TABLE 6

Priorities for Assistance

Classification	General Information	Technical Analysis	Support Personnel	Financial Assistance	Other
Over 5,000	4	2	3	1	5
3,000 - 5,000	2	3	4	1	5
1,500 - 3,000	1	3	4	2	5
1,000 - 1,500	2	3	3	1	4
500 - 1,000	1	3	4	2	5
0 - 500	1	3	3	2	4
Summer Villages	-	-	-	-	-
Local Improvement Districts	1	2	4	3	5
Municipal Districts	1	3	4	2	5
Counties	1	3	4	2	5

(1 = highest priority

5 = lowest priority)

(Priorities derived from questionnaire)

The City of Edmonton has an excellent program of energy conservation for all its departments. Each building or department has a target of energy conservation, realistically set and accepted by the department head. It is the responsibility of the department head to see that this target is realized. As well, motivation for employees is routinely reinforced by bulletins on energy matters, by eye-catching notices, by stickers reminding employees to switch off lights, by seminars and by educational programs. It appears that knowing what to do to conserve energy is not enough. People must be constantly reminded and made aware that it is considered important by higher management. Edmonton has appointed one person with an overall responsibility for energy conservation covering all departments who reports directly to the Board of Commissioners. Naturally to be effective he has to receive the cooperation of department heads.

It should be mentioned here that there is no reason why a policy of energy conservation should reduce employee comfort. The primary focus is to reduce waste. Buildings do not have to be heated to 22°C when no one is there. A timer can turn up the heat before employees are due to arrive. Double or triple glazed windows will reduce heat loss and increase comfort; keeping outside doors closed as much as possible, or the addition of a porch will do the same; lighting can be reduced in unused areas, e.g. storage, washrooms etc., and newer more efficient lamps can be substituted for older types which use much more electricity but which do not provide more light.

4.1.3 Municipal Vehicles

During the course of this investigation it was discovered that about ten or twelve municipalities were considering converting some or all of their fleet of municipal vehicles to propane. The impetus towards this program is the subsidy available from the federal government ("up to $400 for each eligible vehicle ... converted to propane from gasoline"). Mohawk Oil Co. has recently approached some towns offering to help them assess the benefits of this program for their fleets.

Canadian Western Natural Gas has converted some of its own vehicles to compressed natural gas and they are enthusiastic about the feasibility of this fuel as an alternative to gasoline, particularly for fleet vehicles. For rural municipalities the use of alternative fuels, particularly propane, might be a form of energy conservation worthy of consideration because most of their energy costs are for road construction, road maintenance, weed control and roadside mowing. There are however, differing points of view with regard to the cost of storage, the safety of storage and the availability of supplies of both propane and compressed natural gas. It is not the function of this report to judge the feasibility of these alternative fuels, but it is a topic on which municipalities would like more unbiased information. Some municipalities are currently researching the possible benefits of fleet conversion but their findings are not yet available.

4.1.4 Street Lights

The cost of electricity is a major part of the energy bill for urban municipalities and the cost for street lights is a major portion of this. It would appear that if urban municipalities could reduce their electricity use for street lighting significantly there would be a noticeable reduction in the electricity demand for the province. There have been some programs initiated towards this goal. TransAlta Utilties, for the towns which it serves, has adopted a policy of installing only high pressure sodium lamps in new installations. For the same degree of illumination high pressure sodium uses significantly less electricity than mercury vapour. Some towns and cities have also accepted a policy of replacing mercury vapour lamps with high pressure sodium (H.P.S.) when replacement is required (e.g. Red Deer). There are some barriers to this program however. Mercury vapour lamps currently in place have a life of 25 years. To replace a mercury vapour lamp with an H.P.S. one saves energy but may waste money. Financially, it is often more advantageous to leave the mercury vapour lamps in place until their life span is complete. The cost effectiveness of such a transition depends on the relative costs of electricity and the capital cost of the substitution. Another barrier is that some citizens do not like the orange coloured light from the H.P.S. lamps, and another is that a mixture of H.P.S. and mercury vapour lamps on any one street tends to give an odd mixture of lighting colour which some motorists claim to be distracting. A system of street lights designed (according to presently accepted practise) for H.P.S. lamps recommends the use of taller lamp standards than are used currently for mercury lamps and recommends fewer of them - i.e. three H.P.S. standards where currently there are four mercury vapour ones. Only the City of Lethbridge (as far as we know) has accepted a policy of replacing mercury vapour street lamps with H.P.S. ones in spite of the fact that there is still some life left in the mercury vapour lamps.

The incentive to reduce consumption of electricity in the use of street lamps is eroded by the rate structure. When travelling around Alberta it is unusual to enter a strange town without finding some of the street lamps burning during the day. Enquiries to why this conspicuous waste was not more vigourously curbed produced the explanation that as a general rule, street lights are not metered. They are charged on the basis of the number of standards, the number of hours of planned use (probably 10 per day) and the electrical consumption per hour. In other words, in many municipalities the street lighting rate is a flat rate independent of use.

A comparision of the Alberta data contained in the questionnaire responses with data obtained from other provinces and from a federal study of energy use suggests some interesting anomalies. The cost of street lights is a major portion of the energy budget for Alberta urban municipalities. It is not unusual for street lighting to account for 40% of the energy budget and to cost a town up to $20 per capita. This contrasts markedly with the information contained in the Federal publication, issued by the Conservation and Renewable Energy Branch, Energy Mines and Resources, Canada called Municipal Energy Audit: A Practical Guide to the Identification of Energy Expenditures. This publication reports on a study of energy expenditures in six towns or cities. They are Montague, P.E.I. (pop. 1800), Summerside, P.E.I. (pop. 8600), Granby, Quebec (pop. 37,300), Victoria, B.C. (pop. 83,800), Saint John, N.B. (pop. 85,900), Ottawa, Ontario (pop. 304,500) and Winnipeg, Manitoba (pop. 560,900). The percentage of the energy costs spent on street lights in each of these towns was, respectively, 13%, 9%, 9%, 15%, 9%, 9%, 17%. This is a startling difference. Yet our figures are supported by TransAlta Utilities who, from their own sources estimate that street lighting accounts for approximately 40% of urban municipal energy costs.

A recent study from Nova Scotia indicates that the average percentage energy expenditure on street lights in that province for 16 municipalities is 16.5%. This could perhaps be explained if the total per capita expenditure on energy was greater in other provinces than in Alberta but the reverse is true. Per capita expenditure on energy for 16 municipalities in Nova Scotia (1980) is estimated at between $5 and $26. In the federal study (6 municipalities) the range is from $12 to $26 (1977 and 1978 stats) and our Alberta figures show a range of $32 to $51 (1980). In addition, electricity tends to be cheaper in Alberta than in many of the other municipalities studied, so that the much greater Alberta expenditures will buy even more electricity. Further investigation of these anomalies should be undertaken. The results should prove interesting.

There are a number of different ways in which electricity is made available to Alberta municipalities. Some towns such as Calgary, Red Deer, Ponoka, Cardston buy power in bulk from TransAlta Utilities Corporation or Alberta Power. The significance is that the rate structure varies between municipalities depending on their source of electricity. By understanding the applicable rate structure and using that information to best advantage a municipality can lower its power costs without significantly altering its electrical energy use. The techniques and strategies to do this will vary from one municipality to another and indeed from one building to another depending on which rate structure applies.

There are other more fundamental questions about street lights. The function of street lights is to improve safety for pedestrians and safety for vehicular traffic. Illuminations at intersections have a value but a "bright as day" policy for every street in town may not be justified.

From this discussion it would appear that three further studies need to be undertaken. Firstly, if all the mercury vapour street lamps in Alberta were converted to High Pressure Sodium what difference would this make to electrical demand and what design levels are appropriate to fulfil this function? Secondly, what is the function of street lights and are they currently designed to adequately fulfil that function? Thirdly, how do those towns in Eastern Canada which purport to use only 9%-17% of their energy dollar on street lights illuminate their town, especially as their electrical rates are higher than in Alberta?

4.1.5 Public Transit and Municipal Vehicles

In answer to the questionnaires some municipalities indicated that encouragement of the use of public transit was a method of energy conservation. Others were interested in alternative fuels for municipal vehicles.

It has become conventional wisdom to assume that encouragement of public transit will conserve energy. It is not necessarily true, however. In Alberta only Calgary, Edmonton, Red Deer, Lethbridge, Medicine Hat, Grande Prairie and Airdrie have a public transit system. All of them are tax supported and, with the possible exception of Calgary and Edmonton, they are probably an inefficient use of energy. Apart from a few hours a day, spent taking students to and from schools, the transit buses in Red Deer, Lethbridge, etc. have so few passengers that less energy would be used if the buses stayed in the garage, and the few passengers had taxi fares paid for them.

Transit systems, however, are initiated and maintained for reasons other than energy conservation, and once in place they have to maintain a schedule even if they drive around town virtually empty. Given the present situation, energy efficiency can be maximized by good maintenance of vehicles, by driver training, and by consideration of energy use in route planning and scheduling. These means of conserving energy were not mentioned by municipalities either in reply to the questionnaires or in interviews.

Energy efficiency of municipal vehicles can be improved by regular maintenance, by switching off when not in use and by employee awareness of the need for energy conservation. But the response of municipalities to energy conservation in their vehicle fleets was to consider alternative fuels, either compressed natural gas or propane.

4.1.6 Water and Sewer Systems

The energy costs of a water treatment and distribution system and sewage collection and treatment system can be a larger percentage of the total municipal energy bill. For the City of Red Deer, 1980, this was 23.1%. Yet very few of the municipalities mentioned that steps had been taken to try to reduce this cost. The town of Cardston and the City of Edmonton are exceptions. Cardston has a timer which ensures that the pumping mechanism avoids peak power consumption periods.

Most of the energy costs in the water and sewer systems are for the pumping mechanisms. Towns as a rule no longer rely on gravity for water distribution and sewage collection. Even those which have a water tower for water distribution must still pump water up to the reservoir.

Apart from peak power avoidance other energy management strategies could include efficient and appropriately sized electric motors and careful design of the piping in the distribution and collection systems. Many water distribution systems are reported to be inefficient and leaky. This wastes not only water but electricity as more water has to be circulated than is actually used.

A study to determine what conservation measures would be appropriate to reduce energy use in water and sewer systems would probably be helpful. As well as making recommendations for existing systems, information could be made available about energy-efficient new systems.

4.2 RECORD KEEPING

In order to monitor energy conservation it is necessary for municipalities to have base line data showing which type of energy and how much was used for each municipal service. Monitoring is also necessary for feedback. People involved in a conservation program need to know that it is working (or when it is not) in order to maintain the program. The dollar cost of each service is not really sufficient as a base for monitoring energy savings because as costs and rates increase municipalities could save energy and thus avoid having to pay a significant amount while still spending more in dollar terms for the energy used. For example, if the cost of natural gas is $1.25 per Gigajoule and 1000 GJ are used the cost is $1250. But if a conservation program is put in place and 25% saving achieved the use will be 750 GJ. However an increase in price to $2 per GJ will result in a cost of $1500 which is an increase of $250. Without the conservation program, the bill would have been $2000. The conservation program was in fact responsible for a cost avoidance of $500.

It is obviously important that a municipality interested in energy conservation keeps records of energy use in energy terms and also that the rate structure, or structures for each utility be understood. Utility companies are usually ready to cooperate in explaining how their rate structures operate and sometimes a modification in usage based on taking advantage of favourable rate structures can result in significant savings. Comparisons of data over a two-year period should indicate whether or not energy use is increasing or decreasing, and in which parts of the system. If this information is not available from a municipality's own sources utility companies would probably be prepared to supply it.

Not many municipalities record their energy use in terms of energy units (e.g. Gigajoules, Btus, kW.h etc.) The City of Edmonton does. Calgary, Lethbridge and Cardston record energy use in energy units for some of their facilities but their records are not as complete as those for Edmonton. The City of Edmonton has records for all city-owned and operated buildings and facilities of the energy consumption in energy units per square metre per degree day ($kW.h/m^2/dd$ - base for 1980). The number of degree days is a measure of the average temperature during the heating season and thus an indication of how much heating energy is needed. This can be useful in comparing the heating needs for different years.

A number of municipalities record their costs of energy by type of energy for each service in dollar terms (see Table 7) but for many municipalities even this is too complicated. Thirty-five percent of the returned questionnaires left that page blank, or indicated that the information was too difficult to obtain. There may be a number of reasons for leaving that question unanswered. For instance to produce that information might have been possible but time-consuming, or the questionnaire may have arrived at a time when too many other pressing tasks had to be completed. For ten percent of the returns, costs of energy were recorded as costs of utilities and combined either electricity and water or electricity and natural gas. Some municipalities could not record the cost of heating or lighting individual buildings because one meter recorded the consumption for two, three or four buildings. In other municipalities the recreation buildings were operated by a Recreation Society, or an Agricultural Society and the municipality did not process the utility bills.

One of the most useful aids to energy conservation which the provincial government could offer to those towns who are interested in such a program would be a seminar or demonstration on how to keep their energy records in such a form that they could compare consumption in terms of energy units from one year to the next.

The primary reason for including in the questionnaire a request for specific energy costs was to discover what proportion of municipalities had ready access to their costs of energy. But an additional reason was to demonstrate where energy dollars are

TABLE 7

Status of Record Keeping

Classification	No. of Resp.	Provide Specific Costs	%	Data Combined	%	Incomplete Records	%	Info Not readily Available	%
Over 5,000	17	10	59	3	18	-		4	24
3,000 - 4,999	13	7	54	2	15	0		4	31
1,500 - 2,999	7	4	57	-		-		3	43
1,000 - 1,499	7	3	43	1	14	1	14	2	29
500 - 999	13	5	38	1	8	2	15	5	38
0 - 499	21	12	57	-		2	10	7	33
Summer Villages	8	4	50	-		-		4	50
Counties	9	3	33	3	33	-		3	33
Municipal Districts	5	3	60	-		-		2	40
Improvement Districts & Special Areas	4	2	50	-		-		2	50
TOTAL	104	53	51	10	10	5	5	36	35

TABLE 8

Some Examples of the Proportion of Total Costs Attributed to Different Forms of Energy

	Electricity	Natural Gas	Gasoline & Diesel Oil, etc.
	%	%	%
Rural Municipalities			
County of Warner	12	7	81
M.D. of Kneehill	5	4	92
Urban Municipalities			
Town of Stettler	82	8	10 (no transit)
Town of Brooks	78	11	11 (no transit)
City of Red Deer	62	14	24 (inc. transit system)

spent, which services are high energy users and how energy costs vary with different types of municipalities. In rural areas the expenditure on energy is primarily for liquid fuels. For the larger towns, electricity accounts for the primary cost of energy (see Table 8).

4.3 ENERGY CONSERVATION THROUGH URBAN DESIGN

It is obvious from the response to the questionnaires (see Table 4) that as yet only a few municipalities are interested in energy conservaton. Of these few, most are interested in programs which will reduce the cost of energy in their own operation. In other words energy conservation is, in most instances, practised as a means of saving money, of reducing budget demands, of saving tax dollars. Energy-efficient urban design does not necessarily save tax dollars though it will reduce the living costs of present and future citizens.

Questionnaire responses with regard to urban form as a means of reducing energy use referred to increased use of public transit, to specialized transportation services and to bicycle paths. The specialized operations referred to bus programs organized for senior citizens and handicapped people to take them to neighbouring towns for shopping once a week. Unfortunately the ridership of those systems was disappointing. While they were cited as energy conservation measures in replies to our questionnaire, that was obviously not their primary function. They come under a cost shared program of the Department of Social Services and Community Health designed to promote the well-being and enhance the quality of life of the elderly and the disabled. Nevertheless such programs, if successful, simulate a car-pool type of operation and might in fact save a modest amount of energy. Cycle paths are also provided, and are being increasingly provided, by some municipalities. These were also cited as energy conservation measures but most replies indicated that their primary function was recreational. Again, however, these measures have the potential for reducing transportation energy use where they are successfully implemented.

The opportunities for energy conservation through urban design vary with the size of the municipality. In rural municipalities, country residential subdivisions offer the best chance of orienting a house on the lot in such a way as to take the best advantage of solar energy, because these lots tend to be large. In villages and small towns access to sunlight is rarely a problem as there are few incentives to build tall buildings which cast shadows over their neighbours. Mixed urban form, whereby recreational, residential, commercial, educational uses are within walking or cycling distance, is almost inevitable in villages and small towns. On the other hand, these towns and villages tend to resist any suggestion of greater density. Housing in these small communities tends to mean a single family, detached house on a 15.2m (50 ft) or 18.3m (60 ft) lot. In some cases a large lot may have been subdivided and a mobile home may be inserted into the old residential district. Suitably landscaped, the result is quite attractive and this is what these villages mean by in-fill housing and greater density. In newer residential areas however, a 15.2m (50 ft) lot is still preferred and there is resistance to the introduction of 10.6m (35 ft) lots.

Greater urban density, by reducing distances, reduces transportation costs. It can also reduce the heat loss from individual dwelling units in multi-family structures.

The City of Calgary has introduced a number of innovative planning concepts to increase density in residential areas - zero lot lines, smaller lots and mixed residential types within sub-divisions. These are gradually being accepted in Calgary, but for most of the rest of the province the more traditional subdivision design is still preferred.

The City of Edmonton has recently adopted a very comprehensive amendment to the General Municipal Plan, dealing with energy conservation. The introduction contains this statement of policy:

> The City must take a leadership role in the promotion and encouragement of energy conservation for three main reasons. Firstly, it takes time to reshape the city's land use and development pattern into an energy efficient form. Secondly, the way we build today will have a strong influence on the efficiency at which the City and its residents function for years to come. Thirdly, without conservation, rapidly increasing energy prices will have a negative impact on Edmonton's residents and the economic health and welfare of the community. Overall, the policies recognize a need for the City to take an active role in shaping its built environ-

> ment and the activities occurring within that environment to meet the types of energy issues anticipated in the future.

Information on the acceptance of energy-conscious urban design was provided by all eight of the Regional Planning Commissions. While their response varied, it was evident that within each planning commission there were planners who were aware of the desirability of introducing energy-efficient programs or policies in the Regional Plans, Land Use By-Laws, subdivision designs, etc. Employed by some planning commissions, notably Battle River, Oldman River and S.E. Alberta, there are some very knowledgeable and enthusiastic planners with a concern for energy conservation. The responses from the Planning Commissions all indicated that more could be achieved if there was greater awareness, knowledge and interest on the part of the general public, municipal and provincial governments. The Regional Planning Commissions of Calgary and Edmonton, both of whom deal with an area surrounding a large employment centre, were particularly concerned with the costs and energy efficiency of transportation, i.e. the energy consumed by daily travel to and from commuter towns. Other planning commissions had given more attention to the inclusion of energy conservation policies in regional plans and land use by-laws.

The Village of Millet (Battle River Regional Planning Commission) had the first Land Use By-Law in Alberta to give protection to solar heating by protecting the right to sunlight. An extract from the Villge of Millet General Plan states,

> "Coucil now goes further by requiring that new subdivisions be designed to maximize the number of lots which have south exposure for solar heating ..."
>
> "... innovative forms such as zero lot line and mobile home subdivisions will also be allowed ..."
>
> "... the present land use bylaw allows houses as small as $65m^2$ ..."

The proposed regional plan from the same commission includes this policy section on energy conservation

> "... Alberta's energy wealth must not blind us to the fact that most of the currently used sources of energy are non-renewable. Two major energy uses, transportation and space heating, are

greatly affected by planning decisions, and the Commission accepts the responsibility to take energy efficiency into account in its own decisions and in the advice which it gives to municipalities and members of the public.

1) One of the best ways of reducing transportation costs is to create communities which are as self-contained as possible. The Commission strongly supports the establishment of employment, recreation, and shopping opportunities in all communities so as to reduce the need for long distance commuting.

2) The Commission supports the creation of higher densities in both residential and commercial/industrial subdivisions as a way of reducing transport costs.

3) The Commission will give preference to urban subdivision designs which are compatible with public transport systems.

4) The orientation of lots in new subdivisions should maximize the number which have south exposure for solar heating. This may mean the return to something like the traditional grid layout rather than the curves and crescents of the past twenty years.

5) In order to protect south exposures, municipal land use by-laws should address the problem of shade-out by higher buildings.

6) Recognizing that land use is a municipal responsibility, the Commission will encourage municipalities to allow more mixed land uses so as to reduce the length of journeys to work, shopping and entertainment.

7) The development control process should be used by municipalities to encourage energy-efficient building design and orientation, and to discourage inappropriate designs which waste energy.

8) The housing industry is encouraged to prepare comprehensively planned energy efficient subdivisions which use all possible energy conservation techniques, and the Commission will support any necessary changes in regulations which obstruct such developments.

9) At present the public sector is far behind the best private developers in attention to energy efficiency in buildings. New provincial and municipal buildings should be designed and built for maximum energy efficiency so that local builders and developers can observe actual examples of good practice."

It should be pointed out here that references to solar heating do not necessarily require solar collectors (active systems) but refer also to passive solar designs in which the houses are heated by solar gain through south facing windows and other design features.

The Oldman River Regional Planning Commission has also taken some steps within its region to implement energy conservation. Some examples are:

> Town of Nanton General Municipal Plan - Proper street orientation, housing density, building siting, landscaping and building design should be encouraged to enable solar heating of houses.
>
> Town of Fort Mcleod is considering an amendment to its Land Use By-Law to help protect solar access.
>
> Town of Vulcan intends to address energy in its General Municipal Plan 1982.
>
> At Nobleford and Burwell subdivision proposals emphasize east-west streets.

In addition, draft policies for the Regional Plan, 1982, which have not yet been accepted formally by the Commission contain some very specific and thoughtful recommendations with regard to energy conservation and use of renewable energy.

The amendment to the General Plan, recently adopted by the City of Edmonton outlines many objectives with regard to energy conservation which the Planning Department hopes to achieve by working with community groups, developers and other organizations. Some of the issues which this document addresses are:

> Energy conservation is simply sound management practise and a good investment as the prices of oil, natural gas and other fuels escalate. This belief provides the basis for many of the policy initiatives in the General Municipal Plan amend-

> ment on energy conservation. There are, however, several issues to address in the development of energy conservation policies and programs for the community.
>
> Reducing Energy Pricing Impacts
>
> Increasing energy costs will mean significantly higher shelter costs for Edmonton residents. Likewise, in the industrial, commercial and other sectors, energy costs will become an even more significant element in production and operating expenses ...
>
> In light of this impending energy future, Edmontonians need information regarding how they can reduce their consumption of energy and stabilize increasing energy costs ...
>
> Development Regulations and Urban Form
>
> The City regulates the planning and development of land and land uses but actual development occurs through the initiatives of the development industry in response to their market. Edmonton's developers and builders have only recently begun to include energy conserving measures in new building design ...
>
> Designing buildings for energy efficiency is perhaps the most effective means to conserve energy; however, neighbourhood design, in which the development industry is also involved, is of some importance too. The basic goal lies in maximizing the number of building lots in a given neighbourhood which can effectively use passive solar energy. This aspect is important because new energy supplies, conservation, alternative fuels, and reduced consumption cannot compensate for inefficient urban development patterns. Newly developing areas must have sub-division and neighbourhood design features to allow a homeowner to maximize energy conservation. For example, traffic can consume significantly higher amounts of energy over a given neighbourhood lifetime in a subdivision with inefficient land use patterns."

Red Deer Regional Planning Commission stated in the proposed regional plan:

> "The Commission will study energy conservation needs and their application to subdivision design and development standards."

and with regard to the City of Red Deer:

> "Within the City of Red Deer the need for energy conservation has been recognized. Policies of the General Municipal Plan state that studies should be undertaken and determined to evaluate alternative forms of subdivision design, roadway standards, traffic patterns and other elements of urban design that affect the amount of energy consumption. These steps have not been initiated yet."

Other planning commissions indicated that no policy statements with regard to energy conservation had been formulated and that they were waiting for and hoping for some guidance and leadership from the province.

Significantly perhaps, Red Deer Regional Planning Commission did not quote public apathy as a barrier to energy conservation. Other Regional Planning Commissions did. Peace River Regional Planning Commission felt that without leadership from the province, some interest on behalf of municipal governments or a real push from the public they could achieve nothing in terms of energy conservation. Palliser Regional Planning Commission felt that energy conservation was low on their priority list. As a new commission they are still trying to get their public to accept the concept of planning itself. The Calgary Regional Planning Commission indicated that the lack of provincial policies did not encourage them to develop energy conservation policies and also that their over-riding concern was with transportation and its costs - i.e. location of employment in relation to where people live.

The S.E. Alberta Regional Planning Commission and the Oldman River Regional Planning Commission have both undertaken programs to inform and educate the public on matters of energy conservation. These appear to have been fairly successful both in terms of attendance and in the enthusiasm engendered. Medicine Hat and Lethbridge each have a branch of the Solar Energy Society of Canada. A number of local people are interested in the use of solar energy, wind power and other energy conservation and renewable energy measures. Medicine Hat College has initiated a program of seminars on energy conservation. One of these which is being offered for the second time is "Energy Management for High Energy Use Buildings". Another, planned for the spring, will be provided for local people including operators of small business premises and small local industrial enterprises.

But in spite of the enthusiasm and leadership shown by a few towns and some staff members of regional planning commissions there are a number of barriers to energy-efficient urban design. Some of them have already been mentioned. Building firms and contractors are loathe to change their traditional methods. The energy-efficient homes which are being built currently are, like the active solar homes, the result of the interest and motivation of individual citizens. There are more and more of these in all parts of the province and this initiative on the part of the individual citizens may eventually persuade the housing industry to follow suit. This will only occur, however, if the general public finds the product acceptable. At present the appearance of some solar homes and energy-efficient homes detract from their market acceptability. One town manager was very scathing about the appearance of two solar homes built in his community and hoped no more would be constructed. He said he thought they were probably all right if built in the rural area, miles from anywhere.

Other barriers to energy-efficient urban design include Development Agreements and Land Use By-Laws. These often include clauses stipulating that houses should be not less than 100 m^2 (1100 sq.ft.) or 110 m^2 (1200 sq.ft.); they also stipulate minimum set back and side-yards; building codes stipulate where windows shall be placed and this sometimes conflicts with good energy-efficient design. The assessment regulations act as a disincentive to some homeowners considering building a solar home. Some of them have reported that the increased cost of solar equipment, the increased width of walls to provide better insulation and the addition of a porch have increased the assessed value of solar and energy-efficient homes and hence the property taxes. While the saving in energy cost may still be greater than the increase in taxes, the incentive and the motivation have been diminished.

Though neither the Planning Act nor the Subdivision regulations have any clauses which prevent the establishment of energy-efficient urban form, neither do they have any clauses to specifically encourage or require it.

Another of these barriers to energy-efficient urban form is the existence of registered subdivisions which have not been developed or not fully developed. If these registered plans are old enough, as in the case of Fort Macleod they are registered on the grid system and therefore redesigning the land use by-law in such a way that housing is built on east-west streets with a southern aspect presents no real problem. There are, however, other registered subdivisions in the province, registered at the time when planning favoured north-south streets. Unless these can be re-designed, and that may be impossible if some development has taken place, it is difficult to see how they can be adapted to provide a south-facing aspect for many of the houses.

The barriers to energy-efficient urban form most frequently mentioned by regional planning commissions were lack of encouragement, lack of incentive, lack of leadership, and lack of knowledge, understanding and acceptance by the public and municipal governments that energy conservation mattered. Most of the regional planning commissions had access to some information on the topic but most would like more. Specifically, they would like information on climatic factors (solar angles, etc.) on the implementation of feasible application and on the feasibility of some of the innovative ideas. While there are variations from one commission to another, there is a great deal of knowledge and enthusiasm about energy conservation among younger planners in regional planning commissions.

4.4 MUNICIPAL POLICIES FOR ENCOURAGING ENERGY CONSERVATION BY THE GENERAL PUBLIC

Judging by the response to the questionnaire, most municipalities do not yet believe they have any responsibility for information about energy conservation. Of the 104 replies received only 17 indicated that they had taken some steps with regard to the general public. These steps included the encouragement of public transit, use of car pools, bicycle paths, amendments to the General Plan and some public information. The public information consisted in making brochures on energy conservation available in the local library or including them with utility bills.

The City of Edmonton has accepted this responsibility in the recently adopted energy conservation amendment to the General Plan which has already been discussed.

The main thrust of this new policy is that:

> "The City will provide leadership in the community through the development of programs to promote energy conservation and to reduce energy consumption in Edmonton."

Some of the Regional Planning Commissions have accepted responsibility for disseminating information to the general public on energy conservation. In particular, the Oldman River Regional Planning Commission had a display which was taken to two exhibitions in Lethbridge and to fairs in neighbouring towns. An energy quiz and answer sheet were also given to the display viewers. The Commission's regular newsletter has contained articles on energy conservation and their recent workshop took energy conservation as its theme, as did the workshop organized by the S.E. Alberta Regional Planning Commission. Other Regional Planning Commissions did not indicate any programs of public information on this topic.

Public information has been made available to a certain extent by the utility companies. TransAlta Utilties and Canadian Western Natural Gas cooperated in a project for High River. An aerial thermal infra-red scan was undertaken and the results shown to citizens at a public meeting which created a lot of interest. Subsequently both companies cooperated in an audit of the civic buildings. Other information is available to the public from the provincial and federal departments dealing with energy.

As a generalization, it can be stated that municipalities have not offered a program of information on energy conservation to the general public. The few programs they have offered have been designed primarily for other purposes. The public has received some information from other sources, but much more needs to be done before the need for energy conservation and energy conservation measures are widely accepted. In fairness to municipalities, it has to be stated that it is hard for them to pass on information to the public when they lack so much of it themselves.

5. PROMOTION OF INNOVATIVE IDEAS

Apart from some notable exceptions already mentioned, the overall assessment of the attitude of municipalities towards energy conservation is that it is a subject that excites little interest and about which little is known. It would be unfair, however, not to comment on the enthusiasm found in some parts of the province for innovative, even "way-out" ideas. There are four chapters of the Solar Energy Society of Canada Inc. in the province - Edmonton, Calgary, Lethbridge and Medicine Hat. Considerable interest was expressed by staff members of regional planning commissions in testing some of the "way-out" ideas. Many of these ideas are particularly applicable to the rural areas, especially in the southern part of the province.

The use of passive solar energy in residential constructon is quite well accepted by scattered members of the public throughout the province and was discussed in Section 4.3. The cost effectiveness of active solar energy in this Province is still in dispute but there are a number of active solar homes being built in the province, many of them in the Lethbridge area. Statistics supplied by the Oldman River Regional Planning Commission (O.R.R.P.C.) indicate that that area has 2200 hours of sunlight annually. Unfortunately some active solar homes are not well accepted because of their appearance.

Apart from the appearance and some divergence of opinion on the cost-effectiveness of active solar heating in the Alberta climate, other barriers to greater acceptance include the likely increased assessment. In addition, most Albertans plan to stay in a house only about five years and this is not long enough to achieve pay-back. Most home purchasers, also, have a keen eye on the re-sale prospects of their house and this tends to promote uniformity and detracts from the innovative. Gradually energy-efficient features will become selling factors of a home, but that time is not yet. Mortgage lenders too, tend to base their calculations on a guideline which says that not more than 30% of income should be spent on principal, interest and taxes. Lower heating bills for an energy-efficient house are not taken into consideration. Lastly, only a few contractors and sub-contractors in the province are knowledgeable and interested in these innovative designs. Most active and passive solar homes are at present custom built.

Wind power is an alternative form of energy which is exciting the curiosity of some people in rural areas, particularly around Lethbridge but in some other parts of the province as well. Lethbridge, according to O.R.R.P.C., is the fourth highest wind region in Canada. Once again there is a divergence of opinion on the cost-effectiveness of wind power. Other barriers to its implementation are a lack of "know-how", a lack of technical expertise to actually construct or assemble hardware. If wind energy on a farm is to be used as an auxiliary to the present delivery system for electricity the utility company concerned would have to be consulted about the best method of doing this. They might have some reservations. As far as the provision of "know-how" is concerned this should not be too difficult to provide. There are still in the Province some technicians whose job it was to construct windmills in the days before the Rural Electrification Program was in existence.

Another suggestion which was made concerning the use of alternative fuels in the rural area was that hog farmers would appear to produce enough energy to run their tractors if only they knew how to convert manure into biogas. Perhaps no area in the province has this information, but it would appear to be an interesting research project. If it is true for hog farmers then it must be even more valid for feed lots. The use of this by-product might make a difference to the profitability of feed lots. This "way-out" idea whose cost-effectiveness and practibility is not yet known just might be viable. It seems worthy of further investigation.

An idea which would have seemed "way-out" only a few years ago but which is now proving practical is the use of waste industrial heat in greenhouses. Noval Technologies Ltd., a wholly-owned subsidiary of NOVA, an Alberta Corporation pioneered this project at Princess by using waste heat from two natural gas compressor units. Unfortunately a fire at the compressor station destroyed both the station and the greenhouse. However, new construction has resulted in two greenhouses, one of 0.38 hectares and the other 0.44 hectares. Building on this experience, Noval Technologies Ltd. proposes to build two greenhouses adjacent to the Alberta Gas Ethylene Co. plant at Joffre, near Red Deer. AGEC is another wholly-owned subsidiary of NOVA. These two greenhouses will cover an area of 0.97 hectares. When in full operation, they expect to produce tomatoes, cucumbers, spinach, cauliflower and lettuce. There must be other opportunities in the province for waste industrial heat to be used in this way and what has been done by NOVA would make interesting demonstration projects.

At present a great deal of energy and land is wasted by the proliferation of sanitary land fill sites throughout the province. It is estimated that each citizen of Alberta generates 2.2 kg of garbage per day. At present this garbage is collected (by truck) and driven out to the rural area (at a cost of more gasoline) where it is buried in a trench and covered with soil by a grader (more consumption of gasoline). In many instances it is otherwise productive agricultural land which is being used for this purpose. Because of the generation of gases from the buried garbage the future uses of sanitary landfill sites are very restricted. The City of Lethbridge has pioneered the use of a Pyrosol, a pyrolytic garbage disposal which has been developed by a firm in British Columbia. While its use is still in an experimental stage, the plant expects to produce enough energy for its own operation, (Lethbridge Herald, Sept. 3, 1981), and may be able to create gas for other uses as well. The plant can dispose of five tons of garbage an hour.

As with the other innovative ideas discussed in this section, there are differing points of view about the cost-effectiveness of a pyrolytic garbage disposal system. Further research into this and other innovative ideas is required.

District heating has been suggested as a possibility for parts of Edmonton using waste heat from the Rossdale generating station and from the proposed generating station at Genesee.

A new town to be constructed north of Fort McMurray to serve Alsands and other future oil sands plants presents a unique opportunity to develop an energy-conserving town from scratch. With a projected future population of 45,000, this town will be planned and constructed without the hindrance of any existing infra-structure whatsoever. The opportunity to show what can be done to make a town energy-efficient is an exciting challenge. The office of the Northeast Alberta Commissioner is keenly interested in this challenge and a number of highly innovative ideas have been examined and researched. A plan to use waste heat from the Alsands plant to heat residential and commercial buildings in the town was examined. It was found that it would be more expensive to use the waste heat than to use natural gas. Another idea was examined to construct a plastic dome over the central business district of about 14 hectares to provide weather protection and to entrap heat. The feasibility of this idea has not yet been determined. The design of the new town will include other energy-efficient measures whose feasibility has already been proven. When it is built, this town should be an excellent demonstration of what can be achieved even in an inhospitable climate. Unfortunately that position is several years away as the final decision to build the town has not yet been taken.

With all these and other innovative and "way-out" schemes in the province with regard to alternative forms of energy, some support and encouragement to help with technical difficulties and research would probably pay dividends in the long run. It would also show encouragement to those who think about and explore new ideas.

A proposal to encourage new ideas, however, should not detract from the necessity of an educational program to acquaint municipalities and cities with the standard energy conservation measures which have been proven and tested.

6. ROLE OF OTHER AGENCIES IN MUNICIPAL ENERGY CONSERVATION

Not all energy conservation measures which are applicable in a municipality are the sole responsibility of the local government. Other agencies which are involved are the Regional Planning Commissions, Alberta Housing and Public Works, the Alberta Housing Corporation, the Alberta Home Mortgage Corporation, the utility companies and the developers, contractors and builders.

6.1 ROLE OF REGIONAL PLANNING COMMISSIONS

In the preparation of regional plans, general municipal plans, area structure plans, redevelopment plans and land use by-laws, the staff of a regional planning commission are able to give advice and make recommendations with regard to the incorporation of energy conservation measures and guidelines. Oldman River, S.E. Alberta and Battle River Regional Planning Commissions have started to do this. Their recommendations may not be accepted in every case and the guidelines, even if accepted, may not be applied. Most planning commissions indicated that they had some information about energy conservation but that they would like more. Most wanted more positive guidance from the Province as to their role in this field. Fortunately, on the staff of planning commissions there are a few young planners who are enthusiastic about energy conservation and eager to learn more.

6.2 ALBERTA HOUSING AND PUBLIC WORKS, ALBERTA HOUSING CORPORATION, ALBERTA HOME MORTGAGE CORPORATION

Albert Housing and Public Works in its recent publication The Shape of Housing in Alberta: New Opportunities advocates innovative subdivision designs and small lots, narrow lots, zero lot line and multi-family housing sites. Their primary purpose in advocating these housing types is to reduce land development costs per housing unit, to increase the density of people per hectare, taking into account the reduced size of households and to reduce the cost of maintaining public infra-structure. The advocated greater density would also conserve energy by reducing travel distances and heat loss. The publication stresses that while 1978 revisions to the Provincial Subdivision and Transfer Regulations and 1981 Building Code revisions encourage the use of small lots, narrow lots, zero lot lines and improved lay-out for multi-family housing, the local controls and land use by-laws often negate these provincially legislated opportunities. To quote from the report:

> "Housing of the highest quality can be provided on the small and narrow lot. However, this involves a close integration of housing design and sub-division of the site on which it is to stand. ... The widespread use of builders' standardized plans works against the narrow lot idea."

Alberta Housing and Public Works (AHPW) also has an Innovative Housing Program, which

> "is intended to encourage, sponsor and assist research and development in the fields of housing, site and subdivision design, energy conservation, site servicing and urban development which offer to reduce housing costs, increase housing supply or improve the utility or performance of dwelling units or subdivisions."

A number of the projects undertaken under this research program have been oriented towards energy conservation.

Alberta Housing Corporation operates a program of land assembly, occasionally develops land and is involved in the construction and ownership of social housing. AHC builds its social housing to Canada Mortage and Housing Corporation standards which specify a greater level of insulation than the Building Code. Most house construction in Alberta complies with the Building Code only. Where possible, solar access and orientation on the lot are taken into consideration in the design of social housing but economics and topography are the overriding considerations.

Alberta Home Mortgage Corporation currently finances about 40% of the new house construction in Alberta. It is, however, bound by restrictions covering the ceiling price of the house and the income level of purchasers. In order to meet the ceiling price for houses in accordance with AHMC regulations ($74,000) contractors prefer to continue to build traditional houses rather than risk cost over-runs with variations in design. AHMC does not insist on CMHC insulation standards in houses for which they provide the financing. While they are aware of the long-term advantages of lower heating costs which can be achieved by energy- efficient design, and of the fact that the way houses are built now will to a large extent influence the heating bills which have to be paid by their owners forty years hence, the impact of the current need to provide enough housing at affordable prices has overriding priority. They do try to influence the market towards energy-efficient housing by consultation with contractors if they can, providing other considerations can also be met.

6.3 URBAN DEVELOPMENT INDUSTRY AND HOUSING AND URBAN DEVELOPMENT ASSOCIATION OF CANADA

Representatives of these two associations (UDI) and HUDAC) expressed support for energy-efficient subdivision design and energy-efficient housing design but cautioned that there was not yet sufficient public or municipal support for either concept and that, in the case of housing, some energy-efficient features might not be cost-effective within a reasonable pay-back period.

A UDI representative listed a number of ways in which a subdivision could reduce energy costs and also reduce present price of serviced lots. These included narrower streets and one-way streets with parking on one side only in residential subdivisions. This would reduce the cost of servicing, the cost and use of asphalt and the cost of maintenance. Where possible east-west streets would provide a southern aspect for housing, but where topography made east-west streets undesirable a southern aspect could still be obtained. Houses need not be parallel to the roadway. They can be set at an angle, in a herring-bone effect, with driveways at an angle too. Concrete could be considered for roadways instead of asphalt. Landscaping, such as providing evergreen trees on northern exposures, can provide shelter by breaking up the prevailing wind. These ideas, combined with greater density and narrow lots, would reduce the price of serviced lots as well as reducing energy use but, according to the UDI spokesman, municipalities tended to resist them.

A representative of HUDAC recognized that energy conservation features added to a home built now will reduce energy costs over the life of the house but feared that at present natural gas is still too inexpensive to make the pay-back period attractive to home purchasers. Interest rates are currently more important than the cost of energy in the cost of housing. So far there is not enough pressure from the home-buying public to encourage contractors to add energy-efficient features. Currently, the public prefers features such as fireplaces even although they may waste energy. According to the HUDAC spokesman, it will take time, public education and a rise in the price of natural gas in order to create a demand for energy-efficient housing.

6.4 UTILITY COMPANIES

Utility companies have accepted the concept of promoting the "efficient use" of energy (as opposed to the "live better electrically" slogan of the 1960's) and to achieve this they have consumer relations programs, energy management programs, and public awareness programs. The way in which they approach the project depends on their own organization, its size and its problems. TransAlta Utilities (formerly Calgary Power) employs twelve people in its energy management program. Canadian Western Natural Gas has two people employed on this aspect, Northwestern Utilities has three, Alberta Power another three.

TransAlta Utilities has the most comprehensive program. In conjunction with Canadian Western Natural Gas it undertook a project in High River. Firstly, an aerial thermal infra-red scan of the whole town was shown to a public meeting to show the citizens where energy was being lost. As a result, an energy audit was undertaken of the municipal buildings and recommendations made to reduce energy consumption. The public meeting aroused a great deal of interest and it is hoped that, following the energy audit of the municipal buildings, the citizens might be encouraged to adopt energy conservation measures in their own premises.

Canadian Western Natural Gas has done several thermal infra-red scans from the air and publicized the results in the towns concerned. There was a lot of public interest in the photographs. Given sufficient budget and staff, the company would be prepared to do more of this and would offer technical advice on interpretation and would follow up on recommendations.

Northwestern Utilities Ltd. will do an infra-red scan on individual residential buildings in the Edmonton area but because they have only limited resources they are not prepared to advertise this. About 400-500 homes in the Edmonton area are scanned each year, but advertising the service is by word of mouth only. Each survey costs the customer $35.00. They do follow-up to see how well their recommendations have been accepted.

Alberta Power is the smallest power company in Alberta with 20% of the market covering about 50% of the land area. This makes it difficult for them to contact their residential customers individually. Instead they hold seminars for Home Economists employed by the school systems and by Alberta Agriculture. Alberta Power is, however, open to requests for technical information and they have held seminars for commercial, industrial and municipal customers. They will explain the rate structure and offer advice on energy-saving procedures and equipment. A quarterly journal sent to customers advertises available publications.

With regard to street lighting, all new installations installed by Alberta Power will be High Pressure Sodium but the company does not feel it can convert existing installations. TransAlta Utilities has also accepted that no more mercury vapour lighting will be installed and they will convert existing mercury vapour lighting to High Pressure Sodium if this can be done at no cost to the towns. TransAlta Utilities has also held energy conservation seminars for operators of arenas and curling rinks but felt that the turnout was poor. They felt that their most successful program to date on energy conservation was to provide educational materials for school children, grades 4 and 5.

The utility companies have the expertise to provide both information and technical assistance with regard to energy conservation. They all have some programs and are willing to do a great deal more, given bigger budgets and more staff, but all of them report a lack of interest on behalf of the public and a lack of motivation to adopt and continue to apply energy conservation measures.

7. STRENGTHS ON WHICH TO BUILD A PROGRAM OF MUNICIPAL ENERGY CONSERVATION AND SOME OF THE BARRIERS AS REVEALED BY CURRENT ANALYSIS

7.1 STRENGTHS ON WHICH TO BUILD

There are a number of programs, projects and personalities in the field of energy conservation in Alberta which would be of great assistance if a policy of energy conservation for municipalities were to be adopted.

i) The Energy Bus program and its energy audits have been well accepted. The personnel and equipment of the Energy Bus are able to analyze possible savings in energy use for buildings which they examine. At present, however, there is only one Energy Bus for the whole province.

ii) The City of Edmonton has an excellent program of energy management which sets energy consumption targets for every building and facility owned or operated by the City. These targets are individually set for each unit and are recorded by $kWh/m^2/dd$. In addition, the management structure, committee structure, the program of employee involvement and motivation have been evolved to support and achieve the realization of these targets. The City of Edmonton and Mr. Bob Dalby, the Energy Conservation Coordinator, would be prepared to provide demonstrations for other municipalities. The recent amendment to the General Plan which introduces policies for energy conserving development is a first for Alberta. Because it was only adopted recently, it is too early to judge how well it will operate.

iii) Community Colleges could be used for training programs. Medicine Hat College, under the guidance of Mr. Bill Scott, has a program of energy conservation for the general public. Mr. Scott is prepared to offer further seminars and would be prepared to help organize programs on wind energy, passive solar energy and active solar energy. Other community colleges such as Fairview, Olds and Red Deer have the expertise to offer seminars on energy conservation.

iv) Regional Planning Commissions have on staff a number of enthusiastic young planners, who are knowledgeable and interested in solar heating, and the energy-efficient design of subdivisions. With leadership from the province showing their role in this field, they could advise and encourage municipal councils to take more interest in energy conservation.

v) The utility companies have considerable expertise in energy management. On a limited scale, they already have educational programs and facilities for energy audits and for thermal infra-red scans of buildings and towns. They can offer advice on energy management to homeowners, to municipalities and commercial/industrial enterprises.

vi) The experience of those municipalities which have already undertaken some program of energy conservation, even if on a small scale could be used as demonstration projects for other municipalities in the same geographic area, or other municipalities of approximately the same size.

vii) The curiosity and willingness to experiment with innovative or "way-out" ideas on the part of some citizens could be used as demonstrations for other "do-it-yourselfers" in such projects as building windmills, creating active solar heating homes, use of alternative fuels, etc.

7.2 BARRIERS TO ENERGY CONSERVATION PROGRAMS

The barriers encountered in the implementation of an energy conservation program depend on just what is being implemented and what stage it has reached.

The 30% overall response rate to the questionnaires sent to municipalities indicated a lack of interest in energy conservation among municipalities particularly among the smaller ones and the rural ones (see Table 2). The interest level for the larger ones was greater. The answers received indicated that the primary difficulties which municipalities expected to encounter in implementing a program of energy conservation were lack of interest and lack of knowledge.

A lack of expertise and lack of time to carry out recommendations were problems for some of those towns which had already had the benefit of the Energy Bus program. Some of the recommendations of the Energy Bus team could be completed by building supervisors but more complicated recommendations required further technical knowledge. Small towns do not have a wide variety of skills on staff.

Energy conservation tends to be most successful when it is the concerted effort of the whole staff, undertaking a number of energy-saving acts regularly and frequently. To achieve this level of effort requires time, usually time spent by the department head who is already busy. To quote one reply, "One problem with an energy conservation program is that the people in the departments are very busy. This becomes just one more thing they are expected to do. Also there are problems in showing people how energy saving will be of benefit, particularly where the energy is not part of the departmental budget." Another reply stated more tersely, "Lack of time to initiate and maintain a concerted thrust."

Lack of adequate record keeping and the ability to set up an adequate record keeping system in terms of energy units is another handicap when a program of energy conservation is considered. Regional Planning Commissions, in particular, mentioned the lack of leadership from the provincial government and the lack of a clear definition of what their role was with regard to energy-efficient urban design.

The Planning Act and the Subdivision and Transfer regulations do not necessarily preclude energy conservation but nothing contained in them encourages it either. Insofar as municipalities are "creatures of the province" they have no legal powers without an "enabling clause" in provinial legislation. The Planning Acts, 67 (3) states:

> ... a land use by-law may provide for any or all of the following matters, ...
>
> 1 subject to the subdivision regulations, the minimum and maximum area of lots;
>
> 2 the ground area, floor area, height, size and location of buildings;
>
> 3 the amount of land to be provided around or between buildings;
>
> 4 the landscaping of land or buildings;
>
> ...
>
> 7 the design, character and appearance of buildings;"

This would appear to give sufficient authority to allow municipalities to require energy-efficient subdivisions and housing.

Some Land Use By-Laws contain restrictions on minimum lot sizes, minimum house size and regulations about setbacks, side yard requirements, etc. all of which tend to discourage high density settlement.

There is no "right to sunlight" legislation in Canada which means that a tall building can block the sun from its neighbour to the north without that neighbour having any recourse. Obviously if the neighbour has an active solar heated home he has suffered a major loss. A few local Land Use By-Laws have been introduced to protect "right-to-sunlight" in a local situation (e.g. Millet and Edmonton) but it is not quite certain if they would be upheld in court if they were challenged. The City of Calgary, By-Law 2P80, S. 10(1)(a)(xii) states that a development officer may require that an application for a development permit be accompanied by a report showing the effect of wind and shadow produced by the proposed development.

Amendments to the Subdivision and Transfer Regulations have reduced the permitted minimum lot size for urban detached housing from 370 m^2 to 230 m^2, but this is not always reflected in local land use by-laws. For country residential sites, however, the Subdivision and Transfer Regulations specify the minimum parcel allowable for sites not served by a common system of water and sewer to be 1858 m^2. This was based on the accepted technology with regard to water and sewer provisions. However, newer technology might make smaller parcels acceptable. Smaller lots and greater density would reduce transportation costs.

The Building Code contains references to insulation and vapour barriers. There are restrictions on the use of some types of insulation but the Code has only recently (June 1981) indicated minimum insulation standards to be achieved. There are also regulations with regard to location of windows which may deter maximum energy efficiency. These regulations, however, refer to residential buildings and not to commercial or industrial ones.

Assessment policies act as a barrier to the production of active and passive solar homes because the additional cost of construction becomes reflected in an increased assessed value and therefore increased property tax.

The growth of satellite, or commuter towns, around Edmonton - e.g. Leduc, Spruce Grove, Gibbons, Bon Accord, St. Albert, poses problems for energy conservation. The whole question of the relationship of the location of employment and the location of residence has implications for the use of energy for commuter travel which will no doubt be re-thought as the cost of gasoline increases.

The greatest barrier to a program of energy conservation is, however, the fact that energy is still relatively inexpensive compared to other provinces and international markets. This also accounts for the lack of interest and the lack of motivation mentioned in the questionnaire responses. To an extent, the price of energy is artifically low. If government price protection policies were changed there would be a significant impact on consumers. Natural gas is not sold at export price, but at a lower standardized price and further protected by the Price Protection Plan. There is no provincial road tax on gasoline and electricity is priced at a historical cost and not at marginal or replacement cost.

8. PROGRAMS IN OTHER PROVINCES

Other provinces in Canada have undertaken a program of energy audits, as has Alberta, with the use of an Energy Bus jointly funded by the provincial and federal governments. The provinces of Ontario, Nova Scotia and British Columbia have initiated further programs to encourage energy conservation by municipalities. The other provinces, like Alberta, are considering further programs but little information about their results is available as yet.

The province of Quebec has undertaken subsidized energy audits for municipal buildings and schools. Some seminars have been planned as well as a program of offering technical assistance and public information. Some municipalities have tried to reduce energy use in their own operations but feel that they lack technical knowledge.

The province of Newfoundland has held discussions with municipalities on energy conservation and some municipalities have requested demonstration projects. The province of Prince Edward Island has undertaken some municipal audits but has no further program in place yet.

Nova Scotia:

Nova Scotia has undertaken a survey of energy use and expenditures in a representative group of municipalities in order to determine where management efforts should be concentrated and what kinds of techniques might be applicable. They found that information on energy use and expenditure was not generally centralized in a readily accessible form and that it took several months of effort to obtain the data they required for 16 communities. Results showed that expenditure per capita for energy use (all types of energy) by the municipality for its own operation varied from $5.00 for rural municipalities in the survey to $26.00 for the City of Halifax. The expenditure on energy varied from 2% to 7% of the municipal revenue.

Provincial representatives also report that the range of size of municipalities creates a difficulty because different programs are needed for different sizes of municipalities. The Provincial project attempts to help municipalities determine their energy use in energy units for the various municipal services so that a monitoring program can be introduced to record results. If the records are not kept in energy units, energy savings may be unrecorded because of increases in energy costs.

Barriers in municipal by-laws which hinder energy conservation are being identified. Programs of cost-sharing for capital costs are hoped for but are not yet available and, as yet, there are no calculated results of municipal energy saving. Information centres are available to the public and the Department of Education has undertaken a large program in schools, both in saving energy in school buildings and in education programs. Some innovative programs have been discussed, such as encouraging greenhouse operators to make use of methane from land fill sites.

Ontario:

A program of municipal energy conservation was started in 1978. It was a 3-phase program initially expected to take five years but now looks as though it will take seven years. The first phase dealt with municipal energy conservation, the second, which started only recently (September 1981) is called "Off Oil" and deals with conversion to alternative fuels. The third phase will deal with public education and involvement.

Under Phase One, it was discovered, as in Nova Scotia and as our results show in Alberta, that the variation in size of municipalities and the variation in the level of motivation and interest made a blanket approach very difficult. As a result of this, a program was worked out based on self-motivation on the part of the municipality. Help is given from the province in the form of energy audits, resource personnel, seminars and audio-visual presentations. No financial aid is given to the municipality during this phase, but after a municipality has demonstrated a reduction of 10%-15% in energy use they can apply to the province for a grant toward the cost of hiring a municipal auditor. It is expected that 80% of the cost of these salaries will be subsidized by the Province.

Initially it was difficult to convince municipalities that they could save money by saving energy and even now, when the program is well established, it is necessary to keep constantly reinforcing the message. Such public relations "gimmicks" as Energy Weeks are promoted to keep the topic in the public consciousness.

Phase Two - the "Off Oil" program - has as its primary objective the conversion of oil burning furnaces to alternative fuels. Financial assistance is available to municipalities for this conversion in their own operation.

The city of Brampton adopted an energy conservation policy for new housing developments. The design changes incorporated into the new land use by-law, which were expected to yield homeowners an average 10% saving in energy costs, included:

- aligning streets east-west so that all lots face south
- designing each unit so that main rooms are located on the south side of the house
- restricting building height so that house shadows fall on empty space, not another unit's south wall
- extending roof overhangs to shield south-facing windows from summer sun while allowing full winter exposure. Roofs are also to be slanted to allow future installation of solar panels.

This by-law was introduced in Brampton after consultation with local developers. Unfortunately, the housing market since then has not been brisk and very little actual development has taken place under these by-law conditions. In fact, it now appears that, as market conditions improve, the current developers are less than happy with the energy conservation policies. The additional costs attributed to the by-law amendments are estimated by them to be $3,000-$4,000 per unit. In a market where buyers are not yet convinced of the advantages of passive solar homes this was deemed to be uncompetitive. It was also claimed that the Planning Department had overstepped its mandate by dealing with housing features. Some compromise can be reached whereby some of the energy conserving features will be included in standard designs and others will be available as optional extras. Solar orientation of housing will be accepted and the addition of a vestibule entry, but other features such as additional insulation, fireplaces, slanted roof, etc., will be available as options.

Brampton feels frustrated that more help was not available from the province in the form of educational programs aimed at developers and the housing-buying public. They would also have liked to see changes in provincial legislation, such as the Planning Act and the Building Code.

British Columbia:

The Province of British Columbia has taken a rather different approach. It has a three-phase program also; the first phase is to provide information; the second phase, just starting, is to provide demonstration projects; the third will be a program of working with municipalities. The information phase has included the distribution of information, the organization of seminars and the publication of a manual indicating the activities which a municipality might consider. The manual is a general overview of what municipalities can do to save energy and thus to save money. It indicates not only what a municipality can do within its own operation but how it can show leadership to reduce energy consumption by the community. Examples are given of typical energy conservation measures, with reference to the savings which have occurred in communities which have initiated energy conservation programs. The diagrams to illustrate community energy planning, urban land form, land use and site planning should be particularly interesting to municipal officials. The manual includes suggestions on various regulatory measures which can be used to encourage energy-efficient urban design.

The demonstration phase (Phase Two), which has started recently, includes demonstration retro-fit centres will, hopefully, also include passive and active solar programs, studies in urban transportation and neighbourhood energy programs. Finally there will be a third phase which will involve working with municipalities. It is expected that this will involve municipal committees, including local selected officials and a full-time person to work with municipalities, probably on a regional basis.

9. RED DEER CASE STUDY

9.1 INTRODUCTION

The impact of rising energy costs on municipal budgets, particularly on the operation of recreation facilities, has created increasing interest in energy conservation programs for municipalities over the last few years. The City of Red Deer agreed to undertake such a program in cooperation with Alberta Recreation and Parks and the Energy Conservation Branch of Alberta Energy and Natural Resources. As part of the project a consultant was hired by the Energy Conservation Branch to observe and monitor the progress of the Red Deer energy conservation program so that it could be used as a case study for other municipalities. This report contains the results of that observation and monitoring.

It is hoped that other municipalities embarking on a program of energy conservation will benefit from the experience of the City of Red Deer. For this reason the recommendations of the Energy Bus personnel and the difficulties, problems and successes encountered in their implementation are discussed in some detail. Some of the difficulties encountered by the staff of Red Deer will be common to all municipalities. Other experiences may have a more local application. Details of what happened in the Red Deer program may help other municipal officals to implement similar programs.

9.2 PRE-AUDIT EVENTS

The personnel of the Red Deer Recreation Department became interested in energy conservation as a result of a seminar organized in Calgary in 1980 by Alberta Recreation and Parks. The seminar was organized in response to a growing concern about rising utility costs in recreation facilities. After the seminar, City personnel began to gather information on energy conservation from Alberta Recreation and Parks, Energy Conservation Branch of the Department of Energy and Natural Resources, from the provinces of Ontario and British Columbia and even from the United States. Interest was further stimulated by a three-day conference in Grande Cache, which demonstrated how savings in utility bills have been achieved in the recreation complex in that town.

A proposal was prepared asking Red Deer City Council for authority to request financial assistance from Alberta Recreation and Parks in hiring a consultant to do an energy audit of recreation buildings. It was suggested that City Council might want energy audits of other municipal buildings at the same time. The proposal suggested that the first part of the project would identify areas of energy use, areas of possible savings and the low cost/no cost potential saving projects. The second part of the project would estimate the cost of other potential savings and the probable pay-back period. City Council approved the proposal on January 19, 1981.

A committee was established to provide input into the project, with respect to energy use, to help in selecting a consultant and to assist with the project through its various stages. The members of the committee were representatives of TransAlta Utilities Corporation and Northwestern Utilities, a staff member from Red Deer Electric Light and Power, a representative of Alberta Recreation and Parks, a representative from Red Deer College, Mr. Harold Jeske, facility manager for the Recreation Department, and the office supervisor from the same department.

Alberta Recreation and Parks received a formal request from the City for financial assistance to hire a consulting firm, and discussed the proposal with the Energy Conservation Branch of Alberta Energy and Natural Resources. It was pointed out that a detailed study by a consulting firm of the number of buildings on Red Deer's list would be quite expensive and, except for projects which required some technical expertise, probably not necessary.

Instead of a detailed study by a consulting firm an initial study was proposed to look at the overall picture and suggest low-cost/no-cost energy saving options. The Energy Bus audit service, operated by the Energy Conservation Branch, was offered for this initial overview of the Red Deer facilities. The personnel of the Energy Bus would also hold information sessions for building operators and other interested in-house personnel, discussing their findings and the energy-saving goals which can be attained using unsophisticated maintenance skills. The awareness program of the Energy Bus personnel has been designed to try to achieve this.

An amended proposal was suggested to the City of Red Deer. This was that the Energy Bus should be used to do an initial overview, identify the areas where savings were possible and conduct an awareness program. The advantages of this for the City of Red Deer were that it was less costly, was likely to be more effective, would involve the operating personnel and would increase employees' awareness of energy conservation potential. Alberta Recreation and Parks was willing to assist financially in a consultant's engineering study to advise on the feasibility of more capital-intensive energy conservation measures.

This amended proposal was accepted by the City of Red Deer at a meeting held on May 25, 1981. Part of the total proposal was that the City of Red Deer would be used as a case study for other towns and cities and that the City would provide access to all project information to consultants hired by the Energy Conservation Branch. The consultants hired to undertake this case study were Anna Parkinson and Dr. Bill Ross of Urban Consultants Ltd. Their role was only to observe, to monitor and to comment on the energy conservation program. It was not part of their mandate to assist in its implementation. In addition, their function was concerned only with buildings audited by the Energy Bus and not with energy use, energy expenditures or energy programs in any of the other city operations.

Before the Energy Bus audits could be undertaken, the facility operators for the Red Deer buildings to be audited had to complete an energy audit questionnaire, a detailed description of each facility, with energy use data and costs for 14 months preceding the audit. In late July and August, 1981, the Energy Bus undertook audits of the Electric Light and Power Facility, the Transit Garage, the Public Works Garage, the Recreation Centre Complex, the Red Deer Arena, the Kin City Ice Centre, North Red Deer Shelter, the Memorial Centre and the Kinex Building.

9.3 ENERGY BUS AUDITS

After the energy audit of each building the results were presented to the building operators and other interested personnel. Total potential energy savings for each facility are summarized in Table 9. The first presentation was made in the Board Room of the Recreation Centre before a group which included the representatives of Alberta Recreation and Parks, the Energy Conservation Branch, the City Recreation

TABLE 9

SAVINGS SUMMARY

	Building	Annual Energy Cost 1981	Potential Savings 1981	% Savings
1.	Transit Garage	$ 18,600	$ 2,900	16
2.	Public Works Garage	20,300	5,900	29
3.	Electric Light and Power Building	18,000	4,200	23
4.	Recreation Centre	39,800	17,900	45
5.	North Recreation Shelter	1,100	230	20
6.	Memorial Centre	12,500	5,300	42
7.	Red Deer Arena	50,700	5,700	11
8.	Kinex Arena	21,000	3,300	16
9.	Kin City Arena	20,900	3,100	15
		$ 202,900	$ 48,530	24%

Department, the consulting firm and the building operators. Subsequent presentations to each building operator, the facilities manager and a representative of the consulting firm took place in the bus itself.

The presentations in the bus were much more successful. This was partly due to the accessibility of the computer in the bus, but also to the smaller size of the group and the less formal atmosphere. In the larger group the building operators did not make any comments or ask questions. In the smaller group they were prepared to speak up. As these operators know the idiosyncrasies of their buildings and the possible difficulties of implementing the recommendations, it is important that the presentation of the recommendations be made in an atmosphere in which they feel comfortable.

Apart from the presentation made in the bus to building operators, the bus personnel made two further presentations. One was to City Council on Monday, September 28th, 1981, and the other to a meeting of department heads on September 29th. Three aldermen (out of a total of eight) were absent during the presentation to Council but those attending reacted positively to the analysis and proposals for energy conservation and appeared to support the recommendations. Alderman Dan Lawrence expressed appreciation of the "low-cost/no-cost" proposals as being down-to-earth, sensible procedures. Alderman John Oldring asked if a motion indicating Council's support was required and how to ensure further action. The Mayor assured him that follow-up would be automatic. So there is no offical record of Council's support of the energy conservation measures recommended by the bus personnel.

The presentation meeting on September 29th was poorly attended by the department heads. Representatives of the Fire Department, Engineering Department, Electric Light and Power Department, Transit and Recreation attended but no one was there from Treasury or any of the administrative departments. The City Commissioner did not attend. Very few members of the committee established to assist with the energy conservation program were there.

This presentation was longer and the material was presented in greater detail than had been possible in the half-hour allotted by City Council the previous evening. An analysis of each of the buildings surveyed and their potential for energy conservation was presented. The energy conservation recommendations were of two kinds. The first was the "low-cost/no-cost" type and the second included recommendations which required some outlay of capital and which had a longer pay-back period. These recommendations are summarized in Tables 10 and 11.

Recommendations with regard to program implementation were made by the Energy Bus personnel and other representatives of the Energy Conservation Branch. It was stressed that effective control of energy use must begin with management commitment and the setting of realistic goals for each building. The commitment of senior management must then be translated into commitment and motivation by building operators and building users. There is a danger that top management and others may believe that identification of possible savings is the same as achieving the savings. There is also a tendency to believe that energy conservation depends on additional hardware, whereas in fact hardware is often not very important. The efficient operation of the building, is more important, according to bus personnel. This can be implemented in three stages:

1) understand how the building is meant to operate and implement measures to reduce heat loss and energy waste using the present system;

2) improve the present system;

3) introduce technical measures to recover waste heat or reduce electrical use.

It was recommended that realistic objectives should be set which will help to motivate the interest and secure the cooperation of the employees whose actions will determine the energy saving. These objectives should be of two kinds - immediate and long term. The long-term objectives can be developed while aiming at the immediate objectives. Specific and realistic goals, such as the saving of 10% or 12% of energy in the first year, should be set.

The management structure to achieve this saving can vary with the organization but it is important that responsibilities, duties and authority should be clearly defined. The bus personnel pointed out that there are different ways of achieving this. For instance, one person can be held responsible for energy management throughout the entire organization. Alternatively, each department can be held responsible for energy management in its own area with the assistance of an advisor and

TABLE 10

LOW COST ENERGY CONSERVATION MEASURES

(Can be implemented immediately)

	Potential Annual Savings (1981)
1. Reduce Building Skin Loss	$ 13,100
- Reduce operating temperature - Temperature setback for unoccupied hours - Reduce infiltration - weatherstripping	
2. Exhaust/Ventilation Fans	3,100
- Turn off when not needed	
3. Lighting	2,400
- Use lower wattage tubes or - Energy efficient bulbs - Turn off when not needed	
4. Domestic Hot Water	2,200
- Insulate tank/pipes - Reduce temperature	
5. Electrical	1,400
- Consolidate meters - Reduce demand	
6. Sauna	780
- Use timers	
7. Recirculate Heating Air	520
	$ 23,500

TABLE 11

HIGHER COST CONSERVATION MEASURES
(For Further Investigation)

	Potential Annual Savings (1981)
1. Heat Recovery	$ 12,800
- Dehumidifier/Heat Pump - Pool - Heat Recovery - Ice Plant	
2. Lighting Revision - Change to	6,600
- Fluorescent - Metal Halide - High Pressure Sodium	
3. Adding Insulation	3,600
4. Low Emissivity Ceiling	2,000
	$ 25,000

enough meetings of department heads to exchange ideas and solve problems. Another management technique would be to institute different levels of committees to maximize awareness and participation. These committees are unlikely to be successful, however, unless there is a key person with the knowledge, authority and motivation to promote the program.

Whatever management technique is implemented it is essential that the cooperation of all employees is stimulated in much the same way as a safety program is implemented. The analogy to a safety program is apt. Energy conservation measures require the same on-going motivation, dedication and commitment on the part of all employees with one key person whose responsibility it is to stimulate it.

In addition, energy use must be monitored. Accurate records must be available so that employees, department heads, committees and energy advisors discover regularly, accurately and quickly whether or not their energy management program is effective.

9.4 ACTION TAKEN BY THE CITY OF RED DEER

The nine buildings which received energy audits came under four different city departments. Six of them were the responsibility of the Recreation Department, and the others were the responsibility of the Electric Light and Power Department, the Public Works Department and the Transit Department. While the results of the energy conservation program for each building will be reviewed later it is appropriate here to examine the way in which responsibility for energy conservation was handled by senior management and by each of the departments.

The City of Red Deer did not establish definite long or short term objectives. It was left to the department heads whose buildings had been audited to act, or not to act on the recommendations. No immediate follow-up was undertaken to determine the practicality or feasibility of the recommendations. No program of employee awareness or motivation was undertaken by senior management. On the contrary, statements were made indicating that in the opinion of senior management such a program was quite unnecessary. In their opinion all that was required was to issue a management directive to department heads who would then issue a directive down the line and energy savings would occur. To the best of our knowledge no such directive was ever issued but its probable success is open to question.

The Engineering Superintendent of the Public Works Department, the Electric Light and Power Superintendent and his assistant and the Transit Superintendent had the responsibility for implementing the energy conservation program in each of their buildings. They had a copy of the analysis and recommendations of the Energy Bus personnel but very little else. For the first few weeks after the energy audit they did try to make employees aware of energy conservation measures but they had no assistance from outside their own department, no budget allocation and no formal mechanism to discuss problems even with each other. Since all of them already had a full-time job with other responsibilities, the energy conservation program gradually assumed a lower priority in the day-to-day operation of their departments.

All of them did, however, cooperate fully and freely with the observation and monitoring role of the consultant. Most of them indicated in one way or another that many of the "low-cost/no-cost" recommendations were not as easy to implement or as low-cost as they had initially assumed. This applied to turning down thermostats, switching off lights as well as to the installation of timers and replacing lamps. Turning down thermostats and keeping them turned down as well as switching off lights requires a continual program of employee motivation. Switching off lights may also require some re-wiring to install individual switches. Installation of timers requires budget approval and the substitution of energy-efficient lamps is only "low-cost" when existing lamps need replacement anyway.

Harold Jeske, Recreation Facilities Manager, did institute a program of energy management for all the recreation buildings. He undertook a program of employee motivation which included the production of a manual for each building operator indicating steps to be taken in energy management. Production of these manuals took some time, however, and they were not available until the end of February 1982, by which time motivation generated by the energy bus audit had been somewhat dissipated. Mr. Jeske gives as much of his time as he can to energy management but it is only one part of his overall responsibility so that time is limited. As part of his regular responsibility as Facilities Manager he inspects each recreation building once a month. On these visits he makes a point of reinforcing energy conservation procedures with the building operators. He has also distributed stickers, decals and posters in the various buildings to remind employees and building users to conserve energy.

The manual Mr. Jeske has produced for each building is intended as a guide for the current building operators but also as an ongoing instruction to new personnel. One of the problems of employee motivation is that in certain employee categories with high turnover there are constantly new employees to be motivated. Written instruction in the form of a manual cannot do the job alone (for one thing the new employee has to be already motivated to read it), but it helps.

The manuals deal with lighting, general maintenance, domestic hot water systems, space heating and ventilation with action plans for energy conservation procedures.

For some of the energy bus recommendations further study was undertaken to determine cost-effectiveness. Some of the lighting data was forwarded to TransAlta Utilities Ltd. for life cycle cost analysis. However, TransAlta Utilities did not evaluate the recommendations of the Bus personnel but substituted a different set of alternatives. For five of the seven buildings and electrical systems submitted to them for analysis the payback period for capital investment was less than five years without allowing for any increase of electricity rates.

In August 1982 an engineering consulting firm was hired with the cooperation and financial assistance of Alberta Recreation and Parks to examine the feasibility of some of the recommendations which required capital expenditure and involved a longer pay back period. Projects they were asked to study were:

- Heat recovery and dehumidification systems in the Recreation Centre Swimming Pool.

- Timers on lights, water systems, and air handling systems.

- Heat recovery systems in the Arena.

- Consolidation of power meters.

- Low emission ceiling proposal for the Arena.

- Installation of a blanket over the outdoor pool (with due consideration to the manpower required to place and remove it).
- Pay-back of upgrading the various lighting systems.

The firm appointed to undertake this study was Kasten Eadie Engineering Ltd. of Edmonton. Their final report was received by the City of Red Deer at the end of January 1983.

In undertaking the study Kasten Eadie extended this investigation well beyond the terms of reference. They investigated all six recreation buildings and made recommendations for all of them. A comparison of the savings projected by the Bus personnel and by Kasten Eadie is shown in Table 12.

One of the side benefits of the Kasten Eadie study which was appreciated by the City was the continuing association with the staff of the firm. They spent considerable time in Red Deer and were available for on-going discussion and advice on technical matters. As a result of these discussions the terms of reference were modified, amended and expanded during the course of the study to the benefit of the client.

The Kasten Eadie report recommends energy conservation measures which have a simple payback of less than five years and does not recommend (at present) those which have a simple payback of more than that. Calculations are based on the current cost of energy with no allowance for inflation. Costs are based on commercial costs and do not take into consideration the possible availability of city personnel able to implement recommendations. For these reasons the projected savings indicated in the report are considered conservative.

Unfortunately, for some items included in the terms of reference there are still no definite recommendations. For the dehumidification and heat recovery system for the swimming pool four alternative recommendations have been made. Determining which of these is most feasible depends on an evaluation of the capability of the present system, which cannot be undertaken without shutting it down and dismantling it. During building renovations in 1983 this will be done.

The installation of pool covers for the indoor

TABLE 12
SAVINGS COMPARISON

Comparison of predicted savings from Energy Bus and Kasten Eadie Engineering Ltd.[1]

	Energy Bus			Kasten Eadie	
Building	Annual Energy Cost $	Potential Savings $	% Savings	Recommended $	Not Recommended (At this time) $
1. Transit Garage	18,600	2,900	16	Not Analyzed	
2. Public Works Garage	20,300	5,900	29	Not Analyzed	
3. Electric Light and Power Bldg.	18,000	4,200 13,000	23	Not Analyzed	
4. Recreation Centre	39,800	17,900	45	8,200	1,700[2]
5. North Recreation Shelter	1,100	230	20	160	110
6. Memorial Centre	12,500	5,300	42	5,800	3,500
7. Red Deer Arena	50,700	5,700	11	3,100	4,200
8. Kinex Arena	21,000	3,300	16	4,900	910
9. Kin City Arena	20,900	3,100 35,530	15	3,700	1,900
	$202,900	$48,530	24%	$25,860	$12,320

1. Bus personnel used 1981 energy prices. Kasten Eadie used 1982 prices.

2. Additional savings of $2,900 - $6,300 are forecast depending on which recommendation for heat recovery proves to be most feasible.

and outdoor pools is reckoned to have payback periods of 3 1/2 and 4 1/2 years respectively, if space can be found to store them when not in use, if they do not require additional labour costs to manipulate and as long as the useful life of a pool cover is at least six years. In view of all these provisos the Recreation Department has reasonably adopted a "wait-and-see" attitude for the moment.

Heat recovery systems for the Arena were not considered feasible at this time but that evaluation could change if energy prices rise. Timers on various systems were recommended and will be installed.

The low-emission ceiling was recommended as cost effective for the Arena, the Kinex and Kin City. A proposal to install such a ceiling in one of these facilities will be included in next year's budget submission by the Departmental staff.

The payback of upgrading the various lighting systems was evaluated, and incorporated the assessments of TransAlta Utilities as well as those of the Bus personnel. Some of the recommended changes have already been implemented.

No decision was reached on the consolidation of power meters. To consolidate three meters into one would eliminate two minimum charges but whether or not it is feasible depends on the availability of parts and the cost charged by the Electric Light and Power Department of the City of Red Deer.

9.5 ENERGY SAVINGS ACHIEVED IN FIRST YEAR

With assistance fom the Recreation Department and other city departments, the consultants reviewed actual utility records for each of the nine buildings audited by the Energy Bus for the 12-month periods immediately prior to and immediately following the Energy Bus audits of August 1981. In analyzing and evaluating the results, the consultants uncovered a number of computational difficulties and anomalies in the data. These should be of interest to any agency embarking on a similar exercise.

Monitoring energy use from currently available data is much more difficult and imprecise than it might seem. While bills for both electricity and natural gas do indicate consumption in energy terms as well as dollar charges there is often very little regularity in the interval between bills, which in this case varied from 22 to 40 days. In addition, by the time the bill is received it is extremely difficult for the building operator to relate changes in consumption to changes in the building use or occupation. For recreation buildings in particular, use may be seasonal or intermittent. Another complication is that energy bills are sometimes based on estimates instead of on meter readings. If these estimates are either too high or too low, then corrections have to be made in the following months. Sometimes, too, mistakes in meter readings occur. Comparison is therefore only possible on the basis of average daily consumption, which eliminates any appreciation of fluctuating use within each month. Where obviously unrealistic fluctuations occur from month to month, whether due to meter reading errors or unfortunate estimates, a running average may have to be taken to arrive at a realistic estimate of the electricity or natural gas consumption over a period of several months. These techniques are adequate when monitoring consumption as a historical statistic, but are obviously not adequate for planning day-to-day activities to manage energy.

Table 13 and Figure 1 illustrate the difficulties and the fluctuations which occur when using raw data from energy bills. Table 13 shows that for this building over the period studied the number of days in the monthly billing period varied from 25 to 40. Figure 1 shows that even the average daily consumption, calculated from the monthly bills, fluctuated wildly from month to month in a way that cannot be rationalized in terms of the building use. The answer to these anomalies must lie in the billing procedure and therefore for an effective energy management program more accurate and more frequent readings are essential.

Greater accuracy can be obtained by standardizing natural gas consumption by daily temperature in order to allow for changes in temperature during the colder months. Obviously during the winter of 1981/82, which was very much colder than the winter of 1980/81, more natural gas would be needed to keep indoor temperatures constant. This must be taken into account when monitoring energy conservation measures. Information about "degree days", a measure of the difference between indoor and outdoor temperature which gives an indication of space heating needs, can be obtained from Environment Canada. Unfortunately, the measurement of energy use by degree days is less sensitive for summer months than for winter months. This is not a serious problem because most gas is used in the winter months when this measure

TABLE 13

Data From Electricity Bill For Recreation Centre Showing Monthly Fluctuations

Date Meter Read	Comsumption in kW.h	No Of Days	Av. Daily Consumption
18 July/80	59360	28	2120.00
20 Aug./80	41360	33	1253.33
26 Sept./80	21860	37	590.81
22 Oct./80	26720	26	1027.69
19 Nov./80	37120	28	1325.71
29 Dec./80	39840	40	996.00
23 Jan./81	30480	25	1219.20
20 Feb./81	29520	28	1054.29
20 March/81	31440	28	1122.86
23 April/81	33680	34	990.58
20 May/81	30320	27	1122.96
23 June/81	32800	34	964.70
21 July/81	28960	28	928.47
19 Aug./81	38320	29	1321.38
22 Sept./81	33840	34	995.29
21 Oct./81	21840	29	753.10
23 Nov./81	36000	33	1090.91
22 Dec./81	28800	29	993.10
25 Jan./82	28880 (E)	34	849.41
23 Feb.82	31920	29	1100.69
23 March/82	34320	28	1225.71
23 April/82	30640	31	988.39
25 May/82	21600	32	675.00
23 June/82	41520	29	1431.72
19 July/82	36080	26	1387.69
23 Aug./82	39200	35	1120.00
21 Sept.82	28880	29	995.86

E = Estimate

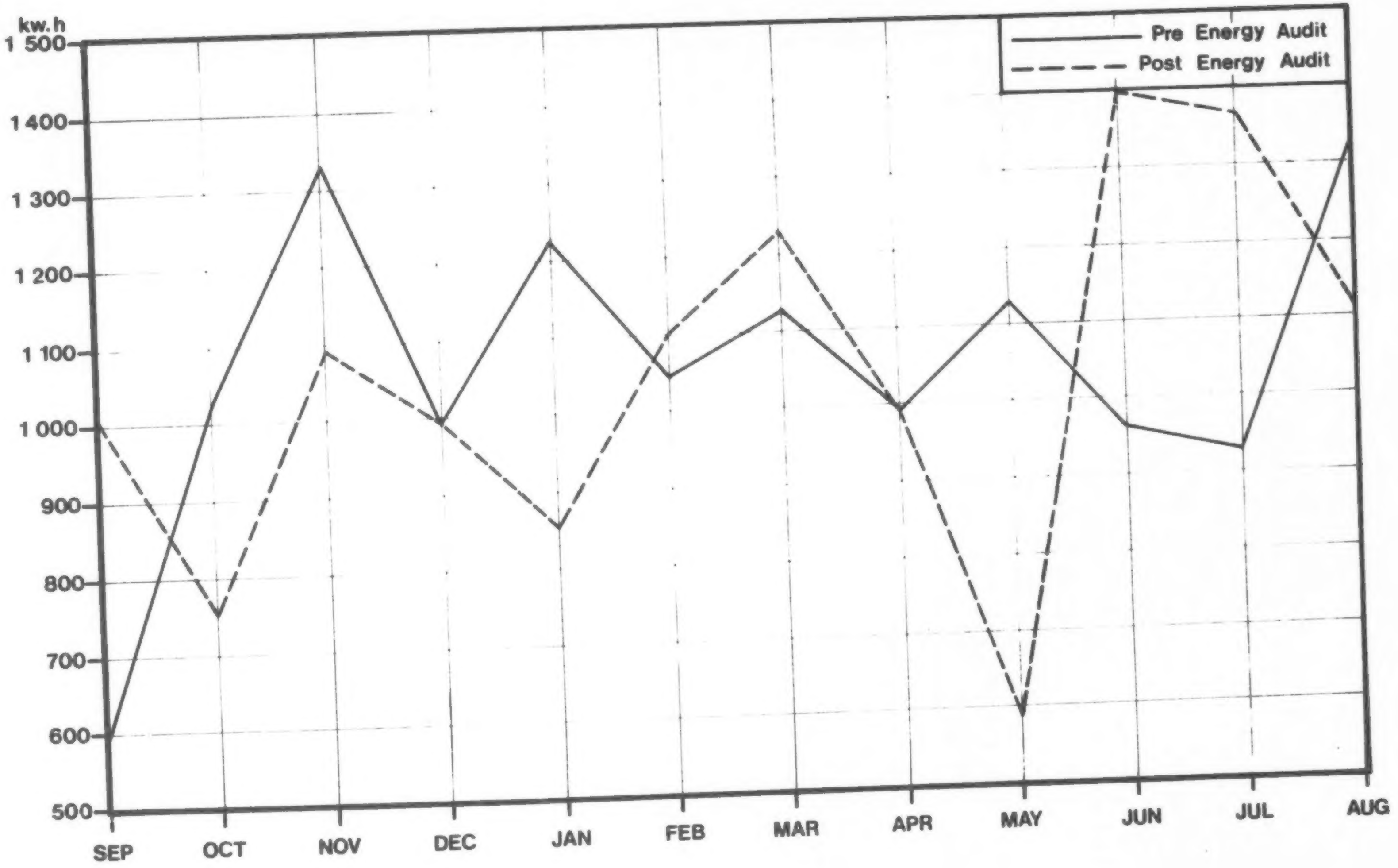


FIGURE 1. RECREATION CENTER - AV. DAILY ELECTRICAL USE

is most useful. However, it can result in apparent anomalies when the information is presented graphically.

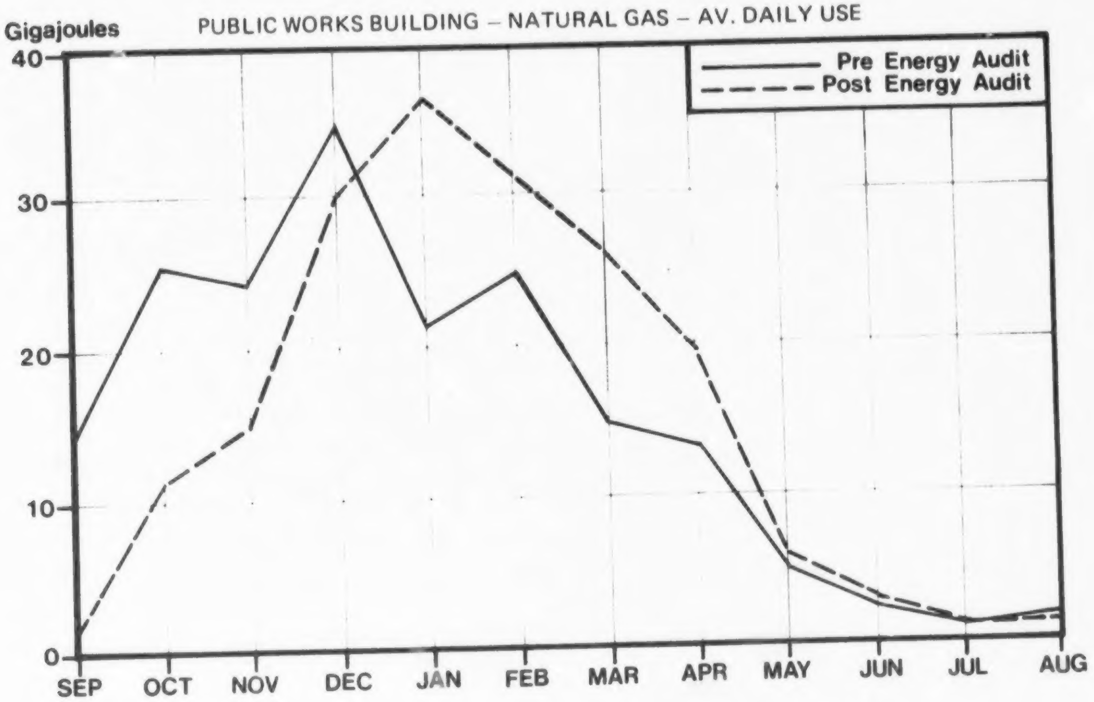
A comparison of the two graphs in Figure 2 indicates these anomalies. The first graph records the average daily consumption of natural gas, unadjusted for temperature. Consumption rates for May, June, July and August for each of the two years are very similar. When adjusted for degree days considerable divergence for the months of June, July and August is apparent. This arises because of the manner in which degree days are calculated and these comparative results for summer months should be disregarded. For most purposes, comparisons of natural gas consumption are more accurate after the consumption figures have been adjusted for variation in temperature. But for the anomalous summer results the graphs showing actual daily average consumption of natural gas represent a better comparison.

The measurement of degree days, however, applies only to space heating. For this reason no adjustment for degree days has been made for the Recreation Centre, where most of the natural gas is used for heating swimming pool water. Degree days for Red Deer are shown in Table 14.

Energy consumption, for the larger facilities audited, as recorded in utility bills over the period September 1980 to August 1982, is summarized in the accompanying charts (Figure 3).

In general, during the year following the energy audit the projected savings which the Energy Bus personnel estimated from "low-cost/no-cost" measures have not been achieved. There are some exceptions. The electricity consumption in the Recreation Centre does show some reduction. The three ice-making plants in the Arena, the Kinex and Kin City also show reduced electricity consumption, although this could be due in part to the lower outdoor temperatures, and hence the reduced load on ice-making equipment. Energy consumption for lighting in the Arena also shows a significant decline.

FIGURE 2. NATURAL GAS CONSUMPTION SHOWING SEASONAL FLUCTUATION



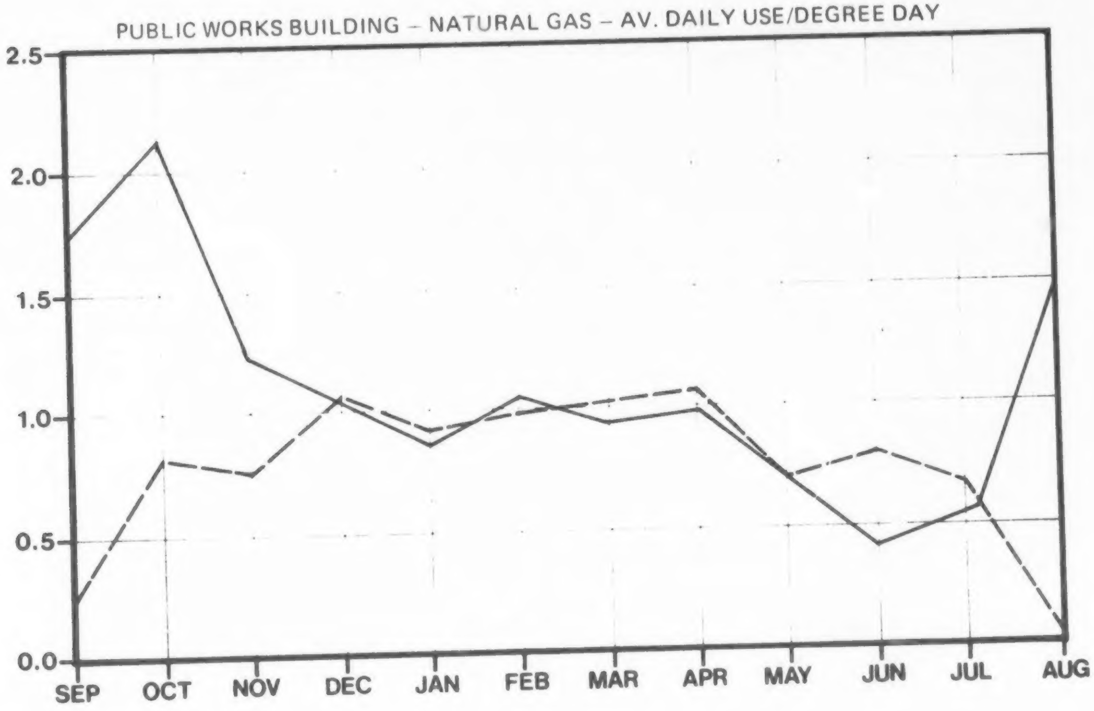


TABLE 14
DEGREE DAYS (CELSIUS) FOR RED DEER AREA

(below 18°C)

Month	1980/81 Total	1980/81 Average per day	1981/82 Total	1981/82 Average per day
September	254.8	8.49	198.5	6.62
October	371.2	11.97	435.7	14.05
November	585.0	19.50	556.6	18.55
December	1004.0	32.39	881.7	28.44
January	749.4	24.17	1237.3	39.91
February	665.2	23.76	901.9	32.21
March	525.8	16.96	787.2	25.39
April	420.3	14.01	531.9	17.73
May	232.8	7.51	286.0	9.23
June	188.1	6.27	118.6	3.95
July	91.1	2.94	82.2	2.65
August	39.1	1.26	136.3	4.40
TOTAL	5126.8	14.46	6153.9	16.86

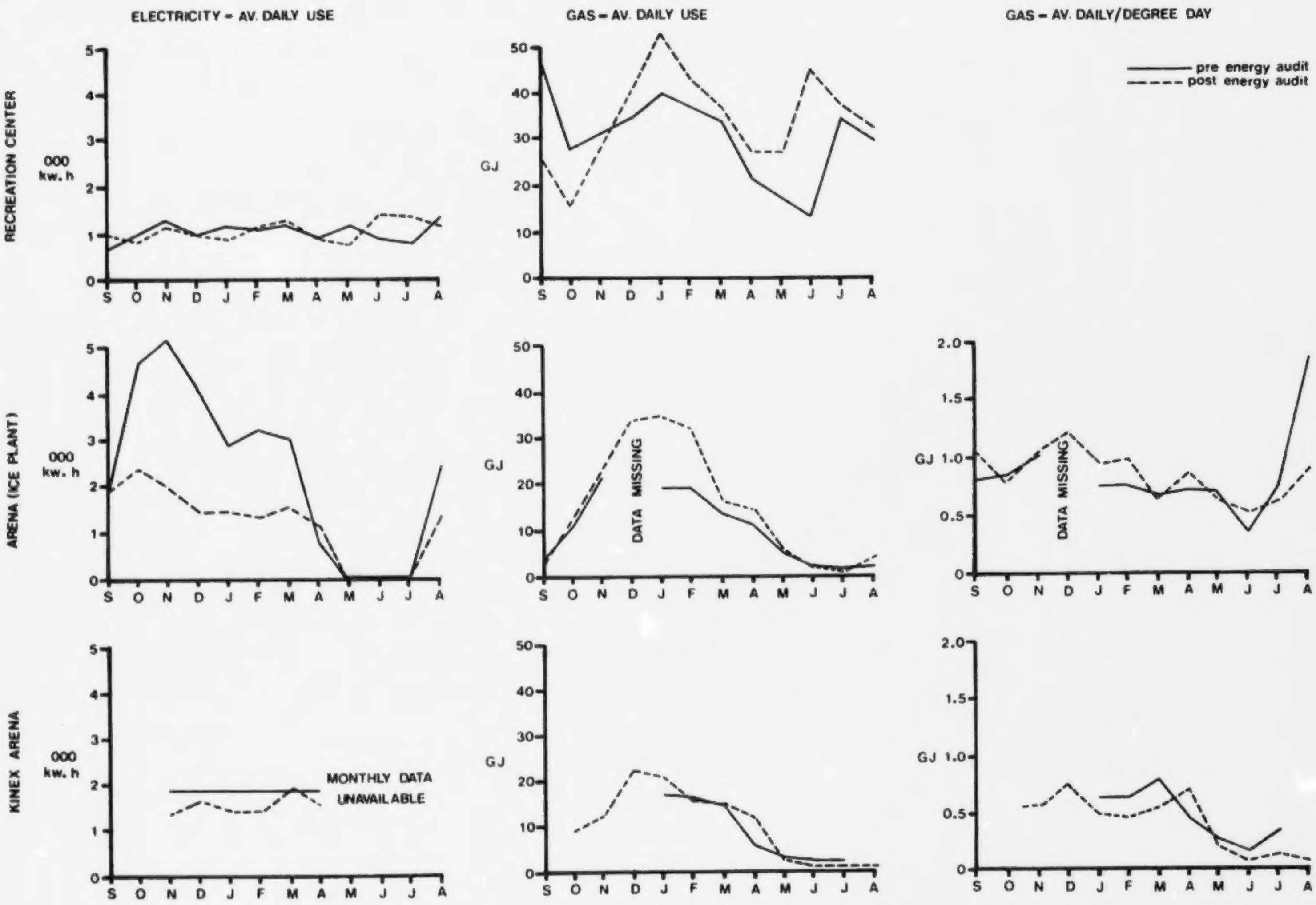


FIGURE 3. ENERGY CONSUMPTION IN CITY OF RED DEER FACILITIES, 1980 - 82.

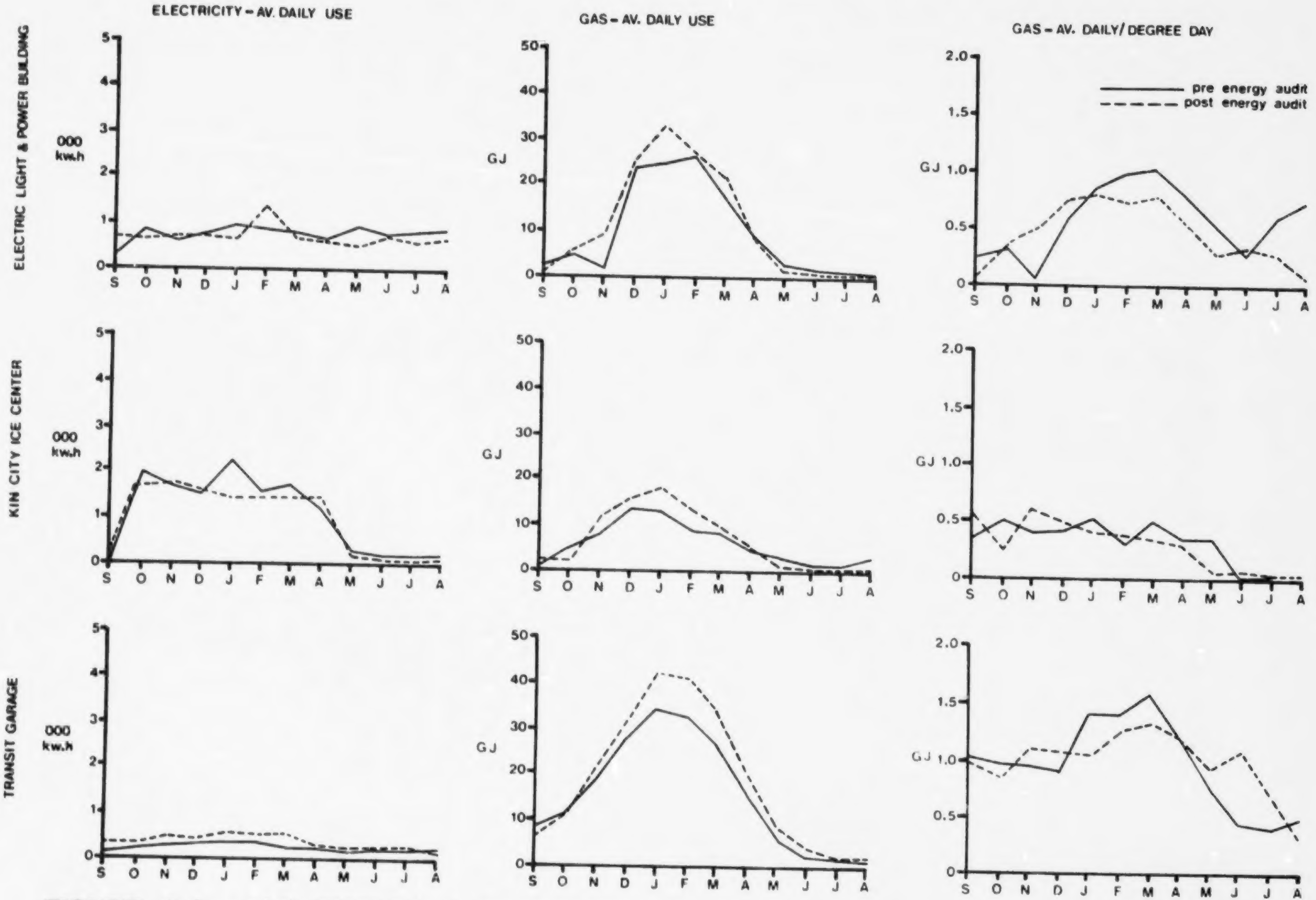


FIGURE 3.(cont'd) ENERGY CONSUMPTION IN CITY OF RED DEER FACILITIES, 1980 -82.

9.6 ANALYSIS, CONCLUSIONS AND RECOMMENDATIONS

1. Overall Results

One year after a series of Energy Bus audits, the overall results of the energy conservation program for the City of Red Deer were inconclusive. The "low cost/no cost" savings projected by the Energy Bus personnel had not yet materialized.

Several reasons for this result can be postulated. The projected savings may not be realistically achievable in the short term. Energy saving techniques may have been too difficult, or there may have been a lack of motivation or of supporting administrative structure. In the opinion of the consultants all of these causes were present to some degree, as elaborated below.

2. Feasibility of Projected Savings

The recommendations of the Bus personnel were based on an examination of the buildings and a computer analysis of the findings. Inevitably, generalizations are employed in the analysis which have to be adapted to individual circumstances. The main purpose of the energy bus audit is to increase the awareness that energy costs can be saved by an energy management program. This is valuable even if all the projected savings cannot be realized.

There are a number of reasons why the projected savings may not be possible, or not possible in the short term. Replacement of lamps by more energy efficient types will save energy but is only a "low-cost" item if phased in very slowly as existing lamps need replacing. Insulating walls and ceilings will save energy but the cost of insulation in an old building which has been renovated and re-renovated may be prohibitive. In addition, many municipal recreation buildings have been re-modelled many times to meet changing needs. For instance, insulating a hot water pipe will save energy but if the dressing room through which it passes then becomes uncomfortably cold the energy savings may not be considered worthwhile.

Other recommendations of the Bus personnel require a program of employee motivation in order to achieve savings.

Some of these constraints were in fact recognized by the City of Red Deer Recreation Department when they established manuals for each building operator based on energy audit results.

Recommendation:

It should be recognized by a municipality undertaking an energy management program that the identification of areas where energy can be saved is not synonymous with saving energy. A result of the audit should be an increased awareness of potential savings. A specific program for each building is required, taking into account the possibilities and the limitations imposed by its structure, its function and its heating and ventilating systems. A realistic target for energy saving should then be set and a management program instituted to achieve it. The target for each building could be different.

3. Follow-up Procedures

The energy audit provided by the Energy Bus and its personnel provided a good analysis of energy conservation potential for municipal buildings but more needs to be done to follow up the initial analysis and enthusiasm. Few municipal employees have expertise in this field. Help is needed with the implementation of the recommendations and also with a program of staff education and motivation.

Recommendation:

A municipal advisory department should be available in the Energy Conservation Branch of Alberta Energy and Natural Resources. This department would provide follow-up assistance after an audit by the Energy Bus. Two kinds of assistance are required --technical assistance to help with the implementation of the recommendations as well as assistance with the management program. For the latter program a supply of films, posters and decals to help with employee education and motivation projects would be useful.

4. Record Keeping

When implementing a program of energy conservation it is important to be able to monitor accurately the consumption of electricity and natural gas. Only by monitoring energy use at frequent intervals is it possible to determine when programs such as manual temperature setbacks are effective.

When consumption data is received long after the period of consumption and has to be averaged over 25, 30 or even 40 days it is impossible to pinpoint reasons for and times of successful and unsuccessful procedures. If the consumption data is inaccurate because of faulty meter reading or estimates then the problem is compounded.

Recommendation:

A municipality undertaking a program of energy conservation should start by training building operators to read the meters in the buildings for which they are responsible and to record the results. Meter reading should be undertaken weekly so that changes in procedure, changes in the building use or changes of temperature can be related to energy use with a reasonable degree of accuracy.

5. Role of Building Operators

The co-operation of the building operators is one key to a successful energy conservation program. In order to obtain this co-operation it is essential that they should not be made to feel that they have been lax or inefficient. Many of the recommendations with regard to energy conservation are based on maintenance tasks (e.g. caulking around windows, weather-stripping doors, insulating hot water tanks and pipes etc.). The presentation has to be made in such a way that personnel do not feel accused of neglecting their duties.

The building operators are the ones with the intimate knowledge of the buildings. Some of the energy conservation recommendations may prove unworkable in individual buildings because of their particular age or structure.

Since energy conservation measures require constant attention, programs of motivation need to be reinforced but without becoming stale and repetitious. This is particularly true for positions where labor turnover is high. Each new employee in turn has to be motivated and educated.

Recommendation:

An energy management manual for building operators, such as the one produced by Red Deer's Recreation Department, is a great help to municipal employees who have to implement energy conservation programs. Further support should be provided through staff meetings where problems and their solutions are discussed and where speakers or films on energy conservation can stimulate interest.

6. Management Structure

The Energy Bus personnel stressed in their presentation the importance of support from senior management for the success of a program of energy conservation. They also outlined three different management strategies and advocated setting realistic goals.

In the Red Deer project none of these recommendations were implemented. While the City Council, the Mayor and the City Commissioner were benign in their approval of the program there was no explicit written resolution or directive to implement their support. Neither did senior civic officials and politicians encourage energy management efforts by attending key presentation meetings. No target was set for energy conservation in the nine buildings audited.

The three management structure alternatives suggested by the Energy Bus personnel were:

i) Appoint one person with responsibility for energy conservation in the whole city operation.

ii) Give the responsibility to each of the department heads but with one person available to provide assistance and expertise.

iii) Give the responsibility to department heads and set up a series of committees at different levels to discuss programs, problems and solutions.

The feasibility of any of the above management structures will vary with the size of the municipality but whatever management strategy is adopted is less important than that there should be one. Like a safety program, results in energy management will not be achieved merely by uttering platitudes.

The City of Red Deer Recreation Department has done an excellent job through meetings with building operators, the manuals prepared for each building and employee motivation. It has, however, taken some time and the results were not yet very noticeable one year after the audits. In part this is due to the lack of assistance available for energy management responsibilities.

Recommendation:

A municipality undertaking a program of energy conservation should make sure that the support of senior management is explicit and visible. The appropriate management structure should be discussed and adopted with the lines of responsibility clearly stipulated.

7. Municipal Buildings

One of the recommendations of the Energy Bus personnel was that to implement an energy conservation program it was first necessary to understand how a building was intended to operate and to operate the present system efficiently. For reasonably new buildings this is logical. For older buildings, however, it may be difficult to do. Municipal buildings and particularly recreation buildings tend to be renovated over the years and thus functions change. The heating, ventilation and air conditioning systems after a number of additions and alterations may be so complicated that it is difficult to tell how to operate them efficiently. The Arena and the Memorial Centre in Red Deer are good illustrations.

8. Municipal Budgets

The municipal budgetary process causes delay in the implemention of any items which require expenditure. Budgets are submitted only once a year and may take up to six months to get approval. While "no-cost" items in Red Deer could be implemented immediately, even the "low-cost" items such as insulation, use of timers and changing to energy efficient lamps required a budget approval.

A change to more energy efficient types of lighting meant that these types of lamps had to be purchased by the City Purchasing Department in order to be available in the city stores. This process takes time. Where it involves a tendering procedure it takes even more time.

9. Time Frame

After another year more positive results of this program should be noticeable. One year of monitoring has not been long enough to show the real effects of the program. With regard to the recreation buildings the program is only just getting underway. In that respect, the charts of metered energy use in each building (see Figure 3) can be used to give management an indication of which areas need more attention.

10. RECOMMENDATIONS

In the event that the Alberta government chooses to expand its present energy conservation services to municipalities, the following recommendations are indicated by the results of this study:

1. The variation in size of municipalities and the variation in the level of motivation, knowledge and interest make a blanket approach to a program to encourage municipal energy conservation very difficult. Any programs which are devised should take into consideration the diverse needs and interests of municipalities.

2. The use of the Energy Bus audit service for municipal buildings should be continued, and, when appropriate, expanded.

3. A municipal advisory component should be available in the Energy Conservation Branch of Alberta Energy and Natural Resources. This component would provide follow-up assistance after an audit by the Energy Bus and would also be able to provide information and advice on municipal operations other than buildings, such as transportation, street lighting, water and sewer services. The services of this component should be available on request from municipalities and not imposed upon them, but once a municipality has accepted an energy audit by the Energy Bus the follow-up services should be automatically available without further request.

   If sufficient interest from municipalities is generated there might eventually be a need for a second Energy Bus to deal solely with municipal concerns. This Energy Bus would hopefully be able to give advice on all aspects of a municipal operation, not just buildings.

4. Information in the form of workshops should be made available to those municipalities who have indicated a need for general information. Written information should be available on request only. The "Municipal Counsellor", a publication of Alberta Municipal Affairs, is an excellent medium through

which to reach municipalities. Articles could be submitted, publications advertised and notices given of workshops. Workshops initially should be programmed to answer the point of view expressed by some municipal representatives "we do not think there is any way in which we can save energy". Programs could show what has happened in other towns e.g. Grande Cache, and what can be done in each of the municipal service areas.

5. Demonstration projects should be undertaken to give practical instruction to municipalities who have the basic information but need help in implementing it. Showing someone how something is done is likely to be much more effective than telling him how to do it. The intention of the demonstration projects would be to inform those attending what results could be achieved and to give them step-by-step instruction on how to do it. When required, follow-up assistance should be made available.

   Some of the demonstration projects might include:
   Basic Maintenance: Weatherstripping, caulking, insulating, care and maintenance of furnaces, maintaining fleet vehicle efficiency, etc. These projects could be demonstrated by a town which has undertaken them successfully e.g. in an arena where energy use has already been reduced, and by a public works garage which has introduced a program to reduce consumption of gasoline.
   More Advanced Technical Programs: These could include the use of heat exchangers, the use of waste heat from compressors to heat water, methods of improving the efficiency of heating systems, understanding the design of heating systems, etc. These programs would be aimed at the "how-to" of projects where the municipality knows what result it wants but has no expertise to achieve it. Several towns which have received an energy audit are in this position.
   Management Programs: A successful program of energy management depends on the motivation of employees and the support given by senior management and City Council. For example, building managers in an energy conservation program need continual reinforcement and recognition from their superiors. If City

Council and senior management do not show support, interest is likely to flag. The City of Edmonton has a very sophisticated management technique in this areas and would probably be prepared to conduct a demonstration project.

Record Keeping and Monitoring: From the returns to the questionnaire it is obvious that very few municipalities keep their records in terms of energy units, but if a municipality enters into an energy conservation program it is essential that they do so. Otherwise they are unable to measure whether their program is a success or a failure, unable to measure which parts of the programs are successful and where and when the failures occur.

It is not particularly difficult to keep records in terms of energy units but demonstration is likely to be more effective than written instruction. In the same session electricity rates could be explained, their influence on electricity bills, and the way in which bills can be minimized by understanding the rate structure.

Innovative Programs: Demonstration projects on the effectiveness of fleet conversion to alternative fuels, on how to install a vapour barrier, on alternative methods of solid waste disposal, on how to design the most energy efficient town, on the uses of biomass on the farm, or on the use of wind energy on the farm. A few demonstration projects along these lines would create a lot of interest.

6. The implementation of the workshop and demonstration programs can be undertaken in a number of different ways:
   a) Hire a consulting firm to do it.
   b) Ask Community Planning Association of Alberta to hold seminars on energy in the same way in which they have held seminars on planning in 1981.
   c) Try to combine a consulting firm and CPAA.
   d) Ask the Association of Urban Municipalities of Alberta (AUMA) to organize seminars and workshops on energy conservation.
   e) Try to combine a consulting firm with AUMA.

f) Ask Alberta Municipal Affairs and Provincial Planning Board to organize seminars, workshops and demonstration programs. It is important that workshops and demonstration projects should not be aimed solely at civic officials nor solely at technicians, though some topics will be more applicable to one group than to the other. The involvement of both is essential to the success of an energy conservation program.

7. Regional Planning Commissions should be encouraged, urgently, to consider energy management as part of their mandate. Decisions made now will affect energy use and the life style and cost of living of citizens for the next forty years. Alberta Municipal Affairs should be encouraged immediately to start working with regional planning commissions to extend their influence in the design of energy-efficient urban form.

   Alberta Housing and Public Works should also be encouraged to review their commitment to, and influence on, the construction of energy-efficient housing.

8. A study should be undertaken to determine as accurately as possible what energy conservation measures can be implemented in water and sewer services.

9. Further study should be undertaken to determine why there is such an apparent discrepancy in street lighting costs between Alberta and other provinces.

10. The utility companies should be used to the greatest extent possible in a program of workshops and demonstration projects. They have the expertise and have expressed willingness to help.

11. Consideration should be given to establishing a training program through N.A.I.T., S.A.I.T., the community colleges and the universities to train people in energy conservation principles and techniques.

12. Some incentive funding should be available for "way-out" ideas which might just prove viable to encourage creative thinkers.

13. There is a need for careful monitoring of all programs and results:
    a) to evaluate which programs work, and why, and
    b) to pass on the information to other municipalities, as in the case of Grande Cache Recreation Complex.

14. The Energy Conservation Branch of Alberta Energy and Natural Resources should undertake a vigorous public information program directed at the general public. A positive attitude on behalf of the general public will help to motivate municipalities and other agencies to initiate energy conservation programs. Alternatively, where municipalities are willing to undertake such a program, the Energy Conservation Branch could assist by providing resource personnel.

APPENDIX

I

ENERGY CONSERVATION FOR MUNICIPALITIES

NAME OF MUNICIPALITY: ______________________________

NAME OF CONTACT PERSON: ______________________________

TELEPHONE: ______________

1. Has your Council and/or your administration considered energy consumption to be an area of municipal expenditure which could be reduced?

YES __________ NO __________

2. If yes, what steps were taken? Whose responsibility were they? Use a separate sheet if necessary.

Steps ______________________________

____

____

Person Responsible ______________________________

3. Have you undertaken any steps to encourage energy conservation by the general public - e.g. encouragement of use of public transit, car pooling, provision of cycle paths, subdivision design?

Steps ______________________________

____

____

4. If so, what was the result of steps mentioned in Question 3?

____

____

____

5. Do you think that you need more information about energy conservation methods? Have you received information and technical assistance of this type? If so, where from?

____

____

____

6. Would you be interested in a program which offered assistance for local energy conservation?

YES ____________ NO ____________

If so, what type of assistance would be preferable? Please allocate numbers 1 to 5 to indicate preference (use 1 to indicate first choice).

General information ____________

Technical analysis ____________

Support personnel ____________

Financial assistance ____________

Other - specify ____________

7. How would you use this assistance in your community?

8. What difficulties have you encountered, or would you expect to encounter in implementing a program of energy conservation? (for example, lack of interest, lack of knowledge, legal difficulties such as building codes or land use by-laws).

9. Can you indicate your energy costs for a twelve-month period by the following categories?

	Electricity $	Natural Gas $	Gasoline, Oil, Diesel. $
Street Lights	________	________	________
Civic Buildings: (name them)			
________	________	________	________
________	________	________	________
________	________	________	________
Recreation: Buildings (name them)			
________	________	________	________
________	________	________	________
________	________	________	________
Water Treatment	________	________	________
Sewage Treatment	________	________	________
Municipal Vehicles	________	________	________
Fire Dept.	________	________	________
Police Dept.	________	________	________
Other	________	________	________

NOTE: For some smaller municipalities accounting records may not be kept in such a way as to make this information readily available. If this is the case, please write across the page "Information not readily available".

If, on the other hand, records are kept of the number of energy units consumed [e.g. kW.h of electricity, MCF (or GJ or therms) of natural gas, litres (or gallons) of gasoline or diesel fuel] please indicate that this information is available and if possible attach it.

10. Is there any further information about energy conservation in your municipality which you think it would be useful for us to have?

____
____
____
____
____
____

11. Do you know of specific energy conservation activities or projects undertaken by other groups in your community? If so, can you supply the name of the group and the type of project.

____
____
____
____
____
____

Response Rate

Classification	No. Questionnaires Sent	No. Questionnaires Returned	% Returned
Over 5,000	27	17	63
3,000 - 4,999	26	13	50
1,500 - 2,999	25	7	28
1,000 - 1,499	30	7	23
500 - 999	35	13	37
0 - 499	98	21	21
Summer Villages	39	8	21
Counties	30	9	30
Municipal Districts	18	5	28
Improvement Districts & Special Areas	23	4	17
			Percent of Total Sent Out
TOTAL	351	104	30

Question 1: Has your Council and/or administration considered energy consumption to be an area of municipal expenditure which could be reduced.

Classification	No. of Responses	No Answers	% of Responses	Yes	% of Responses	No	% of Responses
Over 5000	17	0	0	10	59	7	41
3,000 - 4,999	13	0	0	5	38	8	62
1,500 - 2,999	7	1	14	1	14	5	72
1,000 - 1,499	7	0	0	3	43	4	57
500 - 999	13	0	0	5	38	8	62
0 - 499	21	0	0	2	10	19	90
Summer Villages	8	1	13	0	0	7	87
Counties	9	0	0	4	44	5	56
Municipal Districts	5	0	0	1	20	4	80
Improvement District & Special Areas	4	0	0	0	0	4	100
TOTAL	104	2	2	31	30	71	68

Question 2. What steps were taken?

Classification	No. of Responses	Nothing No Answer No steps taken	%	Conduct Audits/ Studies	%	Form Admin. Committee Current Discussion	%	Use Energy Bus	%	Adopt Conservation Measures	%	School Program	%
Over 5,000	17	7	41	4	24	3	18	1	6	3	18		
3,000 - 4,999	13	8	62	2	15			1	8	2	15		
1,500 - 2,999	7	6	86							1	14		
1,000 - 1,499	7	5	71			1	14			2	29		
500 - 999	13	10	77	1	8					2	15		
0 - 499	21	20	95			1	5						
Summer Villages	8	8	100										
Counties	9	4	44							2	22	2	22
Municipal Districts	5	3	60							2	40		
Improvement Districts & Special Areas	4	4	100										
TOTAL	104	75	72	7	7	5	5	2	2	14	13	2	2

*May total more than 100% due to multiple answers

Question 3 a) Have you taken any steps to encourage energy conservation by the general public?

Classification	No. of Responses	No. of Yes Responses	% of Responses	No. of No Responses	% of Responses
Over 5000	17	9	53	8	47
Over 3,000 - 4,999	13	4	31	9	69
1,500 - 2,999	7	1	14	6	86
1,000 - 1,499	7	-	-	7	100
500 - 999	13	1	8	12	92
0 - 499	21	2	10	19	90
Summer Villages	8	-	-	8	100
Counties	9	-	-	9	100
Municipal Districts	5	-	-	5	100
Improvement Districts & Special Areas	4	-	-	4	100
TOTAL	104	17	16	87	84

3 b) Steps

Classification		Response
Over 5000:	Encourage energy conservation through:	
	Public transit	3
	Car pooling	2
	Bicycle paths	2
	General Plan	1
	Departmental programs	1
	Civic Energy Conservation Programs	1
	Public Information/seminars	2
	Indirect Measures	2
3,000 - 4,999	Ad in newspaper to reduce waste consumption	1
	Provisions in general plan	1
	Encourage car pooling	1
	Encourage conservation in street lighting	1
	New subdivision design	1
1,500 - 2,999	Provide special bus service	1
500 - 999	Encourage turn down thermostats	1
0 - 499	Provision of car pooling	1
	Provision of special bus service	1

Question 4. What was the result of steps mentioned in Question 3?

Classification	No. of Responses	Unknown No Response	% of Responses	Steps Effective	Unknown or Steps Ineffective
Over 5000	17	13	76	2	2
3,000 - 4,999	13	10	77	1	2
1,500 - 2,999	2	6	86	1	-
1,000 - 1,499	7	7	100	-	-
500 - 999	13	12	92	1	-
0 - 499	21	19	90	-	2
Summer Villages	8	8	100	-	-
Counties	9	9	100	-	-
Municipal Districts	5	5	100	-	-
Improvement Districts & Special Areas	4	4	100	-	-
TOTAL	104	93	91	5	6

Evaluation of Effective Steps taken

Classification	
Over 5,000	Increased use of public transit
3,000 - 4,999	Subdivision design incorporates shortened access routes, smooth traffic flow, and reduced stops and starts.
1,500 - 2,999	Increasing use of special bus service.
500 - 999	Consumption of natural gas has remained constant during period of community growth.

Question 5 a) Do you think you need more information about energy conservation methods?

Classification	No. of Responses	No Answer	%	Unsure	%	Yes	%	No	%
Over 5,000	17	2	12	-	-	13	76	2	12
3,000 - 4,999	13	-	-	3	23	8	62	2	15
1,500 - 2,999	7	-	-	1	14	6	86	-	-
1,000 - 1,499	7	-	-	1	14	4	57	2	29
500 - 999	13	-	-	-	-	11	85	2	15
0 - 499	21	4	19	1	5	9	43	7	33
Summer Villages	8	3	38	-	-	-	-	5	63
Counties	9	2	22	1	11	4	44	2	22
Municipal District	5	1	20	1	20	3	60	-	-
Improvement Districts & Special Areas	4	-	-	-	-	4	100	-	-
TOTAL	104	12	12	8	8	62	60	22	21

Question 5 b) Have you received information and technical assistance of this type?

Classification	No. of Responses	Yes	%	No	%	N/A	%
Over 5,000	17	4	24	6	35	7	41
3,000 - 4,999	13	5	38	8	62	-	-
1,500 - 2,999	7	1	14	6	86	-	-
1,000 - 1,499	7	1	14	6	86	-	-
500 - 999	13	-	-	13	100	-	-
0 - 499	21	-	-	17	81	4	19
Summer Villages	8	-	-	5	63	3	38
Counties	9	2	22	5	56	2	22
Municipal District	5	-	-	4	80	1	20
Improvement Districts & Special Areas	4	-	-	4	100	-	-
TOTAL	104	13	13	74	71	17	16

Question 5 c) If so where from?

Classification	No. of Responses	N/A	%	Source Listed
Over 5,000	17	13	76	4
3,000 - 4,999	13	9	69	4
1,500 - 2,999	7	6	86	1
1,000 - 1,499	7	6	86	1
500 - 999	13	13	100	
0 - 499	21	21	100	
Summer Villages	8	8	100	
Counties	9	7	78	2
Municipal Districts	5	5	100	
Improvement Districts & Special Areas	4	4	100	
TOTAL	104	92	88	

Source Listed

Over 5,000	4)	Utility companies, consultants, provincial government, special education, manufacturers, literature
3,000 - 4,999	4)	Energy Bus; personal source, Old Man River Regional Planning Commission, consultants, province, equipment, companies
1,500 - 2,999	1)	Utility company, government seminars, pamphlets, town engineers
1,000 - 1,499	1)	Alberta Parks/Recreation, Federal Government
Counties	2)	Alberta School Trustees Assoc., Alberta Education

Question 6 a) Would you be interested in a program which offered assistance for local energy conservation - Yes - No

Classification	Response	Yes	%	No	%	N/A	%	Unsure	%
Over 5,000	17	15	88	1	6	1	6	-	0
3,000 - 4,999	13	12	92	1	8	-	0	-	0
1,500 - 2,999	7	7	100	-	0	-	0	-	0
1,000 - 1,499	7	6	86	1	14	-	0	-	0
500 - 999	13	11	85	-	0	1	8	1	8
0 - 499	21	11	52	9	43	1	5	-	0
Summer Villages	8	2	25	5	63	1	13	-	0
Counties	9	5	56	1	11	1	11	2	22
Municipal Districts	5	4	80	-	0	-	0	1	20
Improvement Districts & Special Areas	4	3	75	-	0	-	0	1	0
TOTAL	104	76	73	18	17	5	5	5	5

Question 6 b) If so what type of assistance would be preferable? Please allocate numbers 1 to 5 to indicate preference (use 1 to indicate first choice)

Classification	General Information	Technical Analysis	Support Personnel	Financial Assistance	Other
Over 5,000	4	2	3	1	5
3,000 - 5,000	2	3	4	1	5
1,500 - 3,000	1	3	4	2	5
1,000 - 1,500	2	3	3	1	4
500 - 1,000	1	3	4	2	5
0 - 500	1	3	3	2	4
Summer Villages	-	-	-	-	-
Local Improvement Districts	1	2	4	3	5
Municipal Districts	1	3	4	2	5
Counties	1	3	4	2	5

(1 = highest priority

5 = lowest priority)

(Priorities derived from questionnaire)

Question 7: How would you use this assistance in your community?

Classification	No. of Responses	Indicated Ways	%	Unsure	%	N/A	%
Over 5,000	17	11	65	3	18	3	18
3,000 - 4,999	13	8	62	4	31	1	8
1,500 - 2,999	7	3	43	2	29	2	29
1,000 - 1,499	7	5	71	1	14	1	14
500 - 999	13	8	62	4	31	1	8
0 - 499	21	9	43	3	14	9	43
Summer Villages	8	-		2	25	6	75
Counties	9	2	22	3	23	4	44
Municipal Districts	5	2	40	1	20	2	40
Improvement Districts & Special Areas	4	3	75	-		1	25
TOTAL	104	51	49	23	22	30	29

Question 7: (Continued)

Classification	No. of Responses	Operation	%	Public Information	%	Staff Training	%	Special Needs	%	Unsure N/A	%
Over 5,000	17	8	47	4	24	2	12	1	6	6	35
3,000 - 4,999	13	5	38	4	31	-		2	15	5	38
1,500 - 2,999	7	-		3	43	-		-		4	57
1,000 - 1,499	7	4	57	2	29	-		1	14	2	29
500 - 999	13	2	15	6	46	-		-		5	38
0 - 499	21	1	5	8	38	-		-		12	57
Summer Villages	8	-		-		-		-		8	100
Counties	9	2	22	-		-		-		7	78
Municipal Districts	5	2	40	-		-		-		3	60
Improvement Districts & Special Areas	4	1	25	2	50	-		1	25	1	25
TOTAL	104	25	24	29	28	2	2	5	5	53	51

* Edmonton an exception to this table.

Question 8: What difficulties have you encountered, or would you expect to encounter in implementing a program of energy conservation?

Classification	No. of Resp.	Lack of Interest	Lack of Knowledge	Lack of Experts	Legal Problems	Financial/ Capital	Strategy	Institutional/ Political	Unsure	N/A
Over 5,000	17	6	10	4	1	4	1	1	1	2
3,000 - 4,999	13	5	5	-	1	1	-	1	-	1
1,500 - 2,999	7	3	3	-	-	1	-		1	2
1,000 - 1,499	7	5	2	-	-	1	-	1	—	—
500 - 999	13	12	9	1	2	-	-	-	-	-
0 - 499	21	11	6	-	1	1	-	1	1	7
Summer Villages	8	1		-	-	-	-	-	-	8
Counties	9	6	1	-	-	-	-	-	1	2
Municipal Districts	5	2	1	-	-	-	-	-	-	2
Improvement Districts & Special Areas	4	1	3	-	1	-	-	-	1	-
TOTAL	104									

* Edmonton an exception to this table.

* Respondent may make more than 1 response.

Question 9. Status of reporting energy costs

Classification	No. of Resp.	Provide Specific Costs	%	Data Combined	%	Incomplete Records	%	Info Not readily Available	%
Over 5,000	17	10	59	3	18	-		4	24
3,000 - 4,999	13	7	54	2	15	0		4	31
1,500 - 2,999	7	4	57	-		-		3	43
1,000 - 1,499	7	3	43	1	14	1	14	2	29
500 - 999	13	5	38	1	8	2	15	5	38
0 - 499	21	12	57	-		2	10	7	33
Summer Villages	8	4	50	-		-		4	50
Counties	9	3	33	3	33	-		3	33
Municipal Districts	5	3	60	-		-		2	40
Improvement Districts & Special Areas	4	2	50	-		-		2	50
TOTAL	104	53	51	10	10	5	5	36	35

Question 10: Is there any further information about energy conservation in your municipality which you think it would be useful for us to have?

Classification	No. of Responses	Yes	%	No	%	Unsure	%	N/A	%
Over 5,000	17	4	24	5	29	3	18	5	29
3,000 - 4,999	13			5	38	2	15	6	46
1,500 - 2,999	7			3	43	1		3	43
1,000 - 1,499	7	2	29	3	43		3	2	29
500 - 999	13			9				4	31
0 - 499	21			14				7	33
Summer Villages	8			3	38	1	13	4	50
Counties	9			4	44			5	56
Municipal Districts	5			4	80			1	20
Improvement Districts & Special Areas	4			3	75			1	25
TOTAL	104	6	6	53	51	7	7	38	37

Question 11: Do you know of specific energy conservation activities or projects undertaken by other groups in your community?

Classification	No. of Responses	Yes	%	No	%	Unsure	%	N/A	%
Over 5,000	17	4	24	7	41	4	24	2	12
3,000 - 4,999	13			8	62			5	38
1,500 - 2,999	7	2	29	3	43			2	29
1,000 - 1,499	7	3	43	4	57				
500 - 999	13			11	85			2	38
0 - 499	21			17	81			4	19
Summer Villages	8			4	50			4	50
Counties	9			4	44	1	11	4	44
Municipal Districts	5			5	100				
Improvement Districts & Special Areas	4			3	75			1	25
TOTAL	104	9	9	70	67	5	5	20	19

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